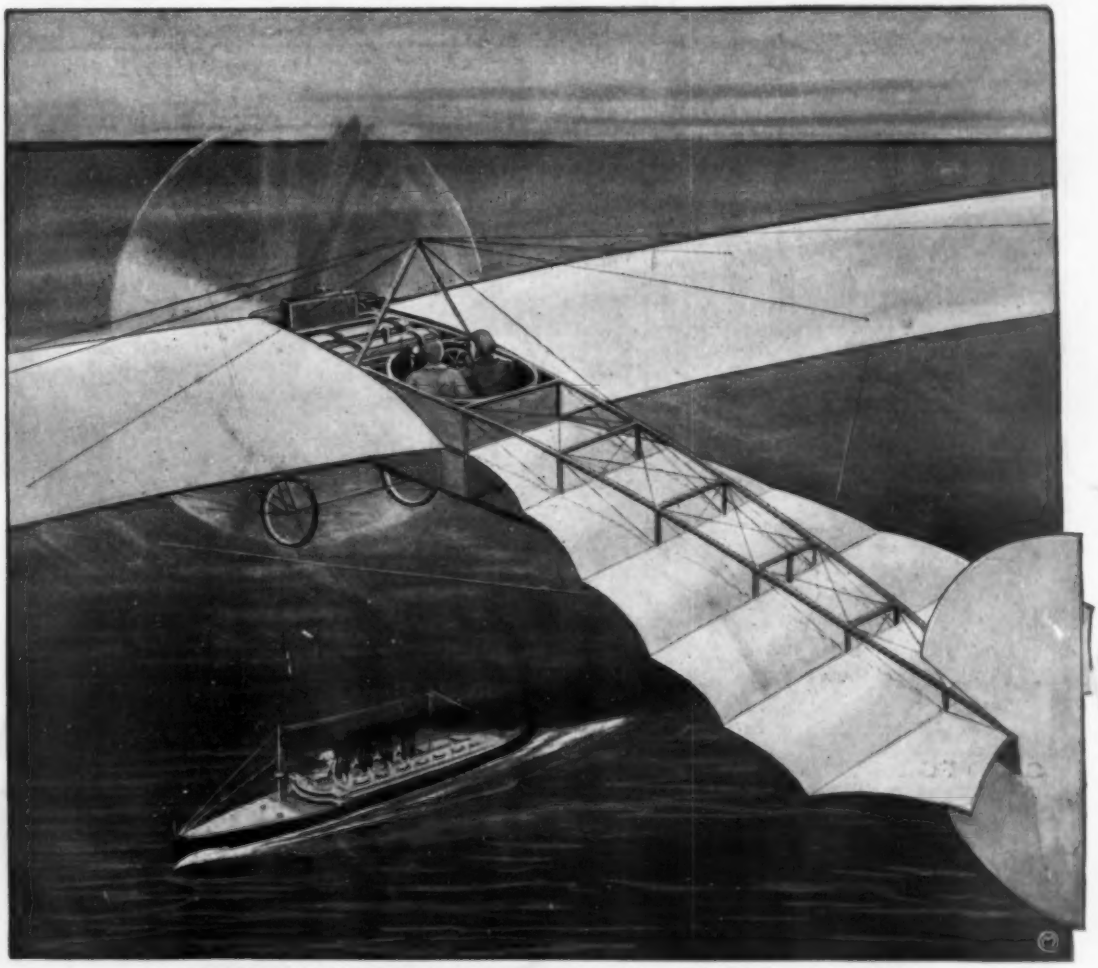
October This Issue 251,000 15 Cents

POPULAR MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT

LARGEST CIRCULATION OF ANY MECHANICAL PUBLICATION IN THE WORLD



"ACROSS THE ATLANTIC IN AN AEROPLANE."—Page 483.

Popular Mechanics offers no premiums; does not join in "clubbing offers," and employs no solicitors to secure subscriptions. It is for sale by nearly every newsdealer in the United States and Canada.

Great Price Wrecking Sale!

Wonderful Fall Sale of Bargains in Every Line

Chicago House Wrecking Co.

We buy our goods at Sheriffs' Sales, Receivers' Sales and Manufacturers' Sales

High Grade Merchandise at 30 to 50% Saving

$10 Overcoat only $5.25

This well-tailored, perfect-fitting single-breasted Frieze overcoat. Thickly padded and quilted lining. This coat is roomy, durable and stylish. Positively guaranteed. Sizes: 34 to 44 in. chest measure. Length regulation, 46 in. Average weight 6½ lbs.

25-A-208. Color Black . . **$5.25**
25-A-209. Color Dark Grey **5.25**

Ladies' Patent Colt Bluchers

This is a rare opportunity to secure high grade patent leather shoes at a give away price. They are made the latest city style. Dull mat top; perforated toe caps. Cuban heels and extension sole.

Sizes 2½ to 8; width C. D. E. and EE. **Price per pair only . . $1.00**
Price per dozen . . $10.80

Nottingham Curtains

M.P. 531. These magnificent Nottingham Curtains come white only; 30 in. wide, 92 in. long. They are the best value in low-price curtains ever sold. Made of extra quality of net in the newest and most popular designs. Sure to wear well and please you. **Per pair 41c**

Elegant Oak Dresser

1-Z-852. An Astonishing Oak Dresser Value. Colonial style, 4 drawers, brass pulls, safe locks, French bevel plate mirror, 24 in. high; rounded frame, neatly carved top, rounded scroll standards, snapely dresser top, 40x19 in. Good casters, splendid golden finish on solid oak. Worth double. **Price only $6.00**

New Lumber

Lot No. 901. Yellow ine Ceiling; Matched and Beaded; Standard engths; Bright, Kiln Dried. No. grade. ⅝x4. Per 1000 ft. . . **$13.50**

his is only one item out of our 20,000,000 ft. Building Lumber. Our General Merchanse Catalog lists a thousand other equally od bargains from the lowest grade Sheathing umber to highest quality Hardwood Flooring.

We are Price Wreckers

in the strictest sense of the term. The goods we furnish and the prices we ask have but one object — to satisfy you. We ask but a small margin of profit.

Here's Why

It is because of our premier position as buyers in vast quantities of high grade merchandise from sheriffs', receivers', and manufacturers' sales.

Our Guarantee

Our $1,000,000 Capital Stock and Surplus besides 17 years of honest dealing is your protection. If you buy any goods from us not entirely satisfactory, we will take them back at our expense for freight both ways, and refund you your purchase price in full.

Electric Weld Fencing

We secured this Fencing at Salvage Sale. Aside from a few slight bruises it is as good as new.

24 in.—26 in. Stays, 6 in. apart. Wt. per rod 7.5. **Price per rod . . . 18½c**
24 in.—26 in. Stays, 12 in. apart. Wt. per rod 6.8. **Price per rod . . . 16c**

Get our bargain list of Wire and Fencing.

Buggy and Harness

This Fine Leather Quarter Top Buggy, black with Brewster green gear, ¾ tires, narrow or wide track, **$34.95**

Fine Single Strap Harness $10.98 At this price we furnish light new harness. Send for booklet.

Steel Roofing

100,000 Squares of new Steel Roofing, which we are now selling at the following price, freight prepaid. Flat per square **$1.60**
Corrugated V Crimped or Standing Seam. Per square **1.85**

Our High-Grade Galvanized Rust-Proof Roofing at prices ranging from **$3.00** per square up. **Send for our Roofing Booklet.** It explains our freight paid offer.

Cement Building Block Machine

$13.85 for a first-class, practical cement building block machine. Blocks 8x8x16 in. You can make whole, half and quarter blocks. Turn out 100 blocks a day. We can supply you complete equipment for making cement blocks and other concrete products. Write us.

Superior Gasoline Pumping Engine

The finest ever for pumping water, running cream separator, etc. Complete with trimmings. Full instructions for installing and operating. **Sold on 30 days free trial.**
2 H. P. Price $36.00
4. H. P. Price . . $64.00

SEND FOR OUR 1,000-PAGE CATALOG No. 539, "THE PRICE WRECKER"

FILL OUT THIS COUPON

cago House Wrecking Co.

saw your ad in Oct. '10 Popular Mechanics. Send me your 1000-page Catalog No. 539, FREE.

Name _____

Town _____ State _____

County _____ R.F.D. _____ P.O.Box _____

This is an economy book. We furnish **Lumber, Dry Goods, Groceries, Shoes, Furniture, Fencing, Hardware, Plumbing Apparatus, Heating Plants,** and so on through the whole range of human needs—all at "wrecking prices." You need this book for daily reference. Every time you make a selection from it, you save from 30% to 50%. High quality merchandise and low prices is the keynote of our success.

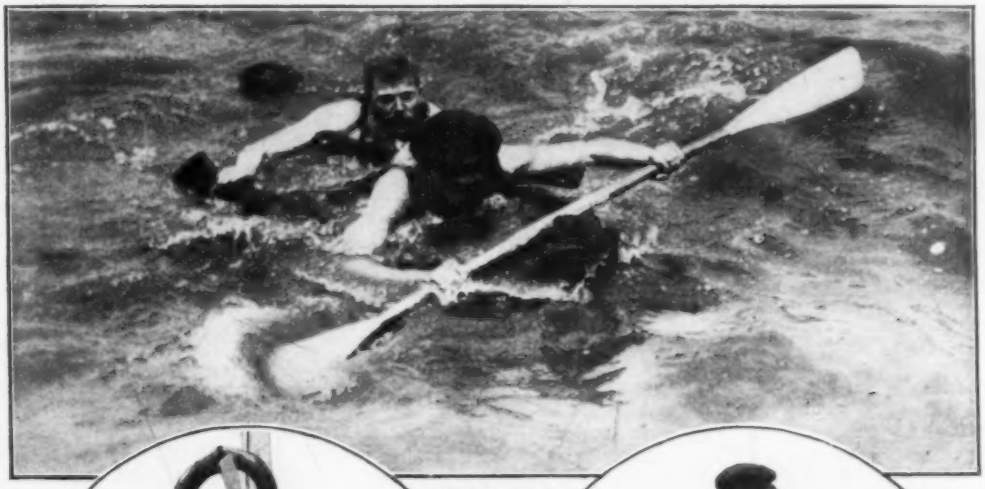
CHICAGO HOUSE WRECKING CO., CHICAGO, ILL.

Popular Mechanics

Written So You Can Understand It

Vol. 14 OCTOBER, 1910 No. 4

PADDLING LIFE PRESERVER



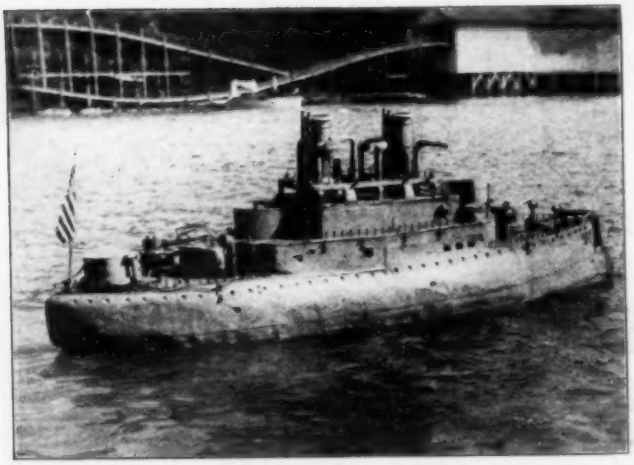
Taking Down the "Sleigh Buoy"

Back to the Shore with Rescued

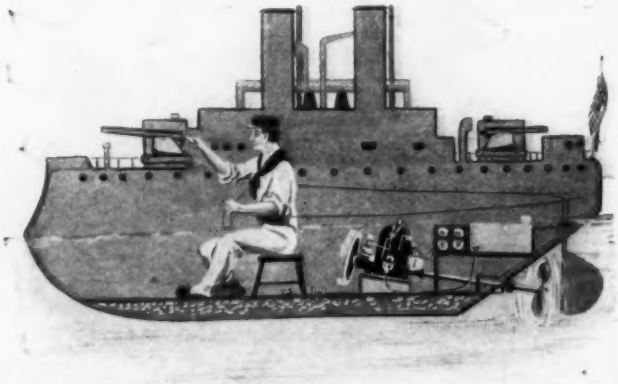
Running Down the Beach

A NEW life-saving apparatus, called the "sleigh buoy", which weighs only 15 lb. and can be easily carried on the run into deep water, then paddled to the person in danger, has just been brought out. It is particularly intended for bathing places, and it is claimed that by its use persons in danger of drowning can be rescued before a boat could be even launched and without risk to the rescuer, as a swimmer, trying to save a drowning person, is often a victim to the struggles of the one he would save. In a case of "man overboard" from a vessel, the "sleigh buoy", manned by one who could propel it, might double the chances of rescue as against an ordinary life preserver thrown overboard.

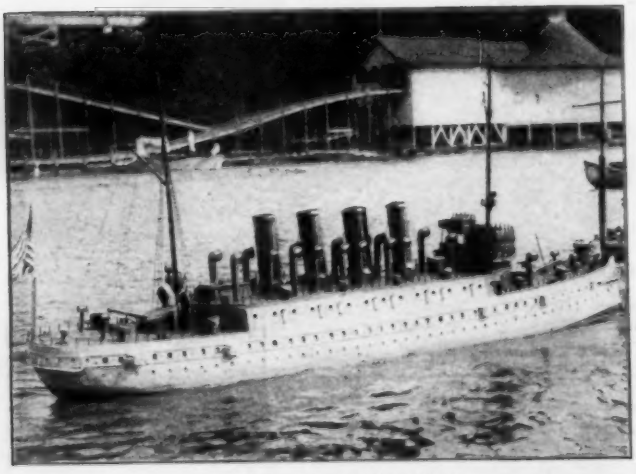
"LIVE" MINIATURE BATTLESHIPS



A Miniature "Dreadnaught"



Method of Operation



One of the Cruiser Class

Real "live" miniature battleships, ranging in size from 9 to 12 ft., each equipped with a 7-hp. gasoline motor, and with guns that fire singly or in broadsides, give realistic naval engagements on a miniature ocean near Cincinnati.

One man, seated in the interior of each ship, operates both the power plant and the guns. The gasoline engines used require but little care, so that the operator can devote almost his whole attention to the rudder ropes and cartridge guns. He enters by means of a movable turret, and his observations are made through the many small portholes.

The little battleships are constructed entirely of steel, and were built by a corps of naval mechanics, long in the employ of the navy at the Norfolk yard.

¶The cruisers "Birmingham" and "Salem" have gone on a trip to South American waters for a further test of the wireless telegraph apparatus with which they have been equipped. The first test, which took place in the Atlantic, off the Virginia Capes, was only partially successful. Modifications in the apparatus are being made with a view to insuring communication from the ships to the wireless station at Brant Rock, Mass., at a distance of 3,000 miles.

THE TELESCOPES OF THE ALPS

In many parts of the Alps are look-out stations provided with powerful telescopes through which parties making difficult ascents may be watched. In some instances the persons looking through them have been the first to note signals of distress and to send aid that has been the means of saving lives.

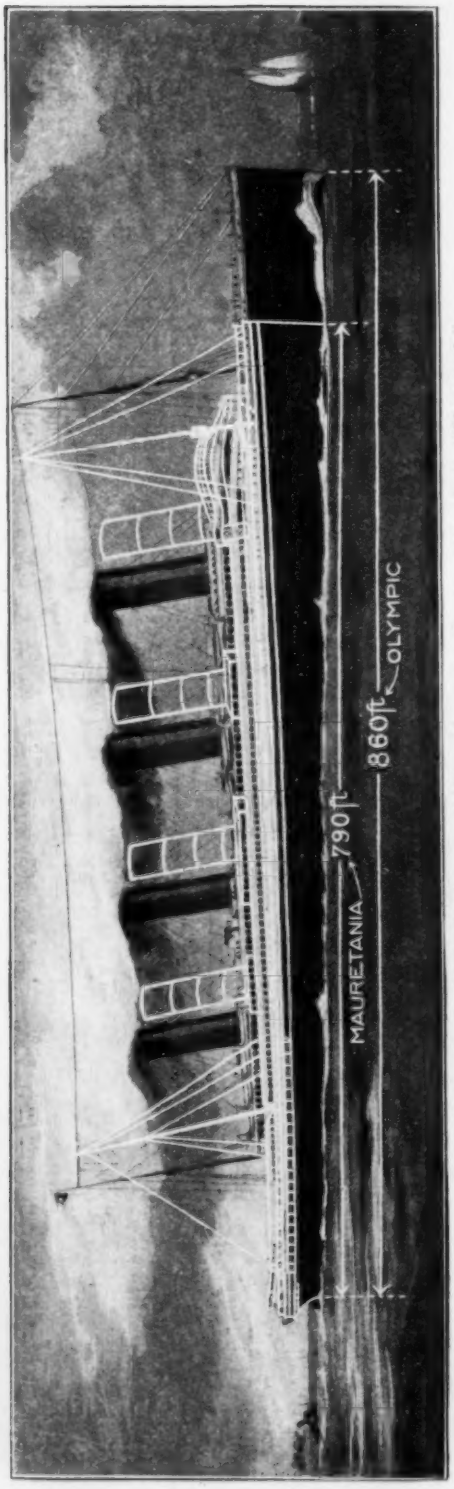
The instruments are nearly all 5 in. in diameter and 6 or 7 ft. long. They were erected by the mountain railways of Switzerland and are often used by members of parties who do not care to make the difficult ascents, but desire to watch their more venturesome companions do so. The climbers may often be brought so close that they may be seen cutting steps in the ice, placing their feet in them, and slowly mounting upward.

GLASS FROM SLAG

Slag obtained from various iron works in England is being made into glass by a concern in Liverpool. Proportions of sand and sulphate of soda, and in some instances a little lime, are put into the blast furnace, converting the ordinary slag into a glass that is available for slates, paving-blocks, bricks and tiles.

It is said that slates can be manufactured at less than half the expense of Welsh slate. They have a polished appearance, and can be made in any size and shape, and in many colors. A house roofed with it, so one

High Up on a Mountain Side—Watching Alpine Climbers



The "Olympic" as She Will Appear—Outline Shows Comparative Size of the "Mauretania"

source of information claims, could dispense with skylights, and even windows would not be required on the top floor.

THE COMING LEVIATHANS

The great transatlantic liners "Lusitania and "Mauretania," pointed to as the wonders of the seas since their maiden trips, will, at a not far distant date, have to give up the blue ribbon for immensity to the "Olympic" and "Titanic." These vessels will hold the honor for a more or less short period and then, in turn, will relinquish it to the two 60,000-ton leviathans of whose future building the Cunard Line has made announcement.

A complete description of the "Olympic" and "Titanic" is still impossible, as the White Star Line officials refuse to give out details. The length, however, will be in the neighborhood of 860 ft., the beam 90 ft., and the displacement 45,000 tons. The "Olympic" will be launched in October, if all goes well, and the "Titanic" will follow a little later.

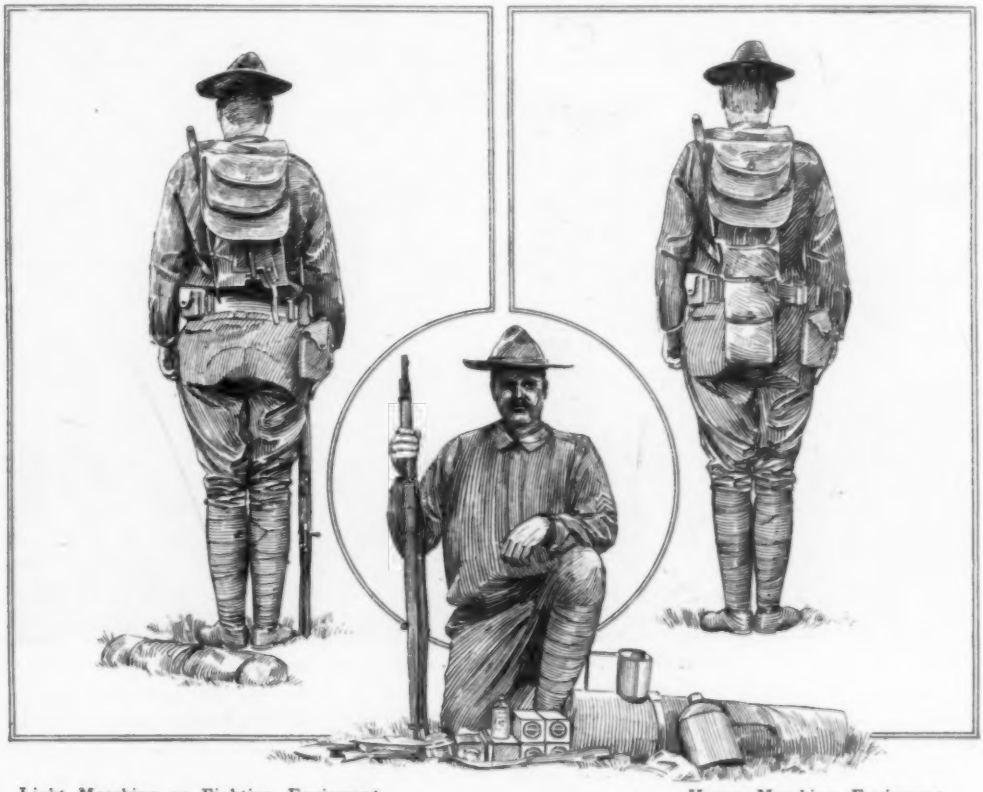
PROPOSED PACK FOR U. S. INFANTRY

A new and much improved pack equipment for infantry soldiers, which accomplishes a reduction of 10 lb. below that now carried in the heaviest equipment, and 17 lb. in the normal equipment, has been recommended to the Secretary of War by the army equipment board, specially appointed for the purpose.

The first consideration of the board was the reduction in weight of the equipment now carried by the infantry soldier, which is 56½ lb. The second consideration was the arrangement of the load to be borne by the soldier in such manner as to reduce to a minimum the fatigue incident to its carriage, with the least interference with the arms and legs. In the present equipment, all the articles considered essential are attached to the belt, the result being a considerable amount of

interference with the legs, when marching. The blanket roll, carried over the shoulder and across the chest, is a great impediment to proper breathing.

In the proposed equipment, all articles, except the canteen and the first-aid pouch, have been removed from the belt and attached to the haversack, which is borne on the back, the bayonet being attached to the left side of the haversack, and an intrenching tool at the back. The blanket, poncho, and shelter tent are made into a short roll, which is attached to the bottom of the haversack.



Light Marching or Fighting Equipment — Heavy Marching Equipment

Articles of Proposed Infantry Pack

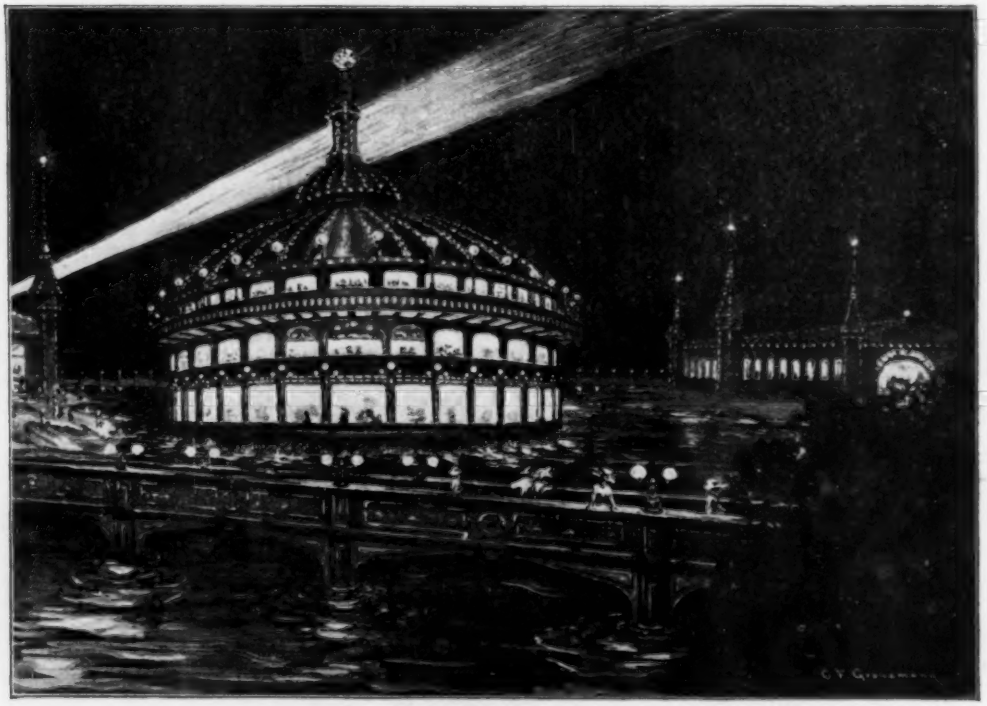
One important feature of the new equipment is the facility with which the soldier can divest himself of the articles essential to his health and comfort in the field, but not to his fighting efficiency, while in action. This can be done by simply withdrawing a coupling strap, which holds the back carrier to the bottom of the haversack, and unstrapping the hooks attached to the bottom of the pack, which falls off, leaving the soldier with his rifle, ammunition, intrenching tool, canteen, first-aid packet and poncho, and two days' rations.

Normally, the soldier will not carry the blanket, poncho or shelter tent, these being made up into a roll and carried on the company wagon. When cut off from transportation facilities, however, he will have to carry them, and at such times his equipment will weigh 47 lb., which, also, includes the weight of the clothing worn. The normal equipment weighs 38 lb., including clothing worn by the soldier.

The illustrations show the proposed pack open, except roll; the equipment with roll detached, which is the normal and fighting arrangement; and the heavy marching equipment.

REVOLVING CAFE FOR CALIFORNIA RESORT

Plans have been drawn and accepted for a unique seaside attraction at Santa Monica, Cal. It will be a revolving café. It will have a diameter of 110 ft. and the dome will be 55 ft. from the concrete piles. This pier, which is to be the largest pleasure structure of the kind in the west, will have a floor space of 280,000 sq. ft. The steel café is estimated to cost $45,000.



Makes Four Revolutions an Hour While Patrons Dine

water. The first floor will be stationary, but the second and third circular floors will revolve around a large central axis. The first of the revolving floors will serve as a café, and as four complete revolutions will be made in each hour, the dinner visitors will have an ever-changing scene of sea, city and mountain. The third floor will serve as a roof garden, and here a band will be stationed. The center of the device will not revolve, and on the café floor this space will be utilized as a kitchen. Nine thousand electric bulbs will light the amusement feature at night. The revolving dome café will occupy a position 900 ft. from the tide line, being constructed upon a pier of reinforced

INTERNAL COMBUSTION UTILIZED IN ANCIENT TIMES

It is a question in some minds whether the gas or internal combustion engine resulted in the practical automobile and motorboat, or whether the popular demand for horseless vehicles and power-propelled small craft resulted in the practical internal combustion engine. But, disregarding this fine question, it is positive that internal combustion was known and utilized in a crude way in ancient times.

"It is altogether probable," says the Water and Gas Review, "that the ancients possessed a greater knowledge of the effects of heat than has reached

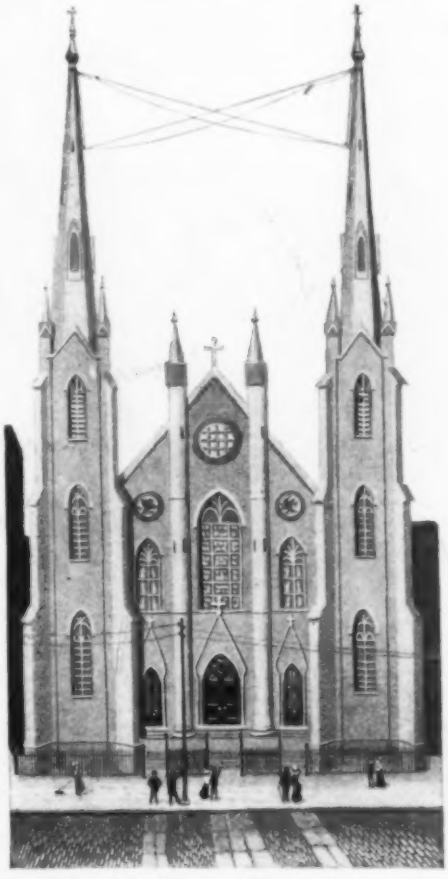
us in any permanent records. One of the earliest machines in which the action of heat was converted directly into motive power was not only a gas engine, but a gas turbine. The so-called 'smoke jack' used in medieval times to operate the turnspit before the fire consisted of a sort of screw propeller wheel, placed in the chimney and caused to revolve by the action of ascending gases, the motion being transmitted by means of gearing and belts to the spit. There are numerous instances of such devices, of which illustrations were made by the great painter and engineer, Leonardo da Vinci.

"About the first record of any patent covering gas engines, the one taken out in England in 1791 by John Barber, was for a motor which seems like an anticipation of present-day attempts to produce a gas turbine. Strange to say, Barber used gas produced by distilling wood, coal, oil or other hydrocarbons in a retort, the coal gas being delivered with the proper amount of air into an explosion or combustion chamber, where ignition took place and the products of the combustion were discharged against the buckets of the turbine wheel."

SLIDING ON CABLES HIGH IN AIR

While removing the crosses from the 150-ft. twin spires of the Church of the Assumption, Philadelphia, steeplejack Hassler slid over cables from spire to spire in company with his two assistants, while hundreds of people watched in amazement.

In commencing the difficult task, the men first climbed up the steep stairs in the interior of the spires, and, clambering out the windows, hitched themselves up the almost perpendicular sides a foot at a time until the top was reached. Rope ladders were then made fast and ropes were strung from one steeple to the other. It was these ropes that the steeplejacks used as a means of getting from spire to spire, choosing this method rather than climbing down one and then up the other when a change of working base was necessary.



Steeplejacks Traveling from Spire to Spire

Seated on a strip of board suspended from a light rope, they slid back and forth with less thought or trouble than some people would have in crossing a street.

The distance between the spires is 80 ft., but the distance traversed was considerably longer, due to the slant of the traveling cables. Hassler believes that he is the first to ever adopt aerial cables as a means of getting from spire to spire.

¶Automatic electric controls have been installed in wasteways placed at two-mile intervals along the main canal of the Yakima, Washington, irrigation project, to prevent overflows.

Artistic Plaster House Owned by C. Haskins, Quincy, Mass.

Copyright, Boston Photo News Co.

A GROUP OF OFFICIALS OF FUHKIEN'S FIRST RAILWAY
Third from the Left, Mr. Cheng Hsu, Manager; Fourth, Mr. Wong Hui Nan, Chief Engineer; Fifth Mr. Chun Bao Tsun, President

China's First Really Chinese Railroad

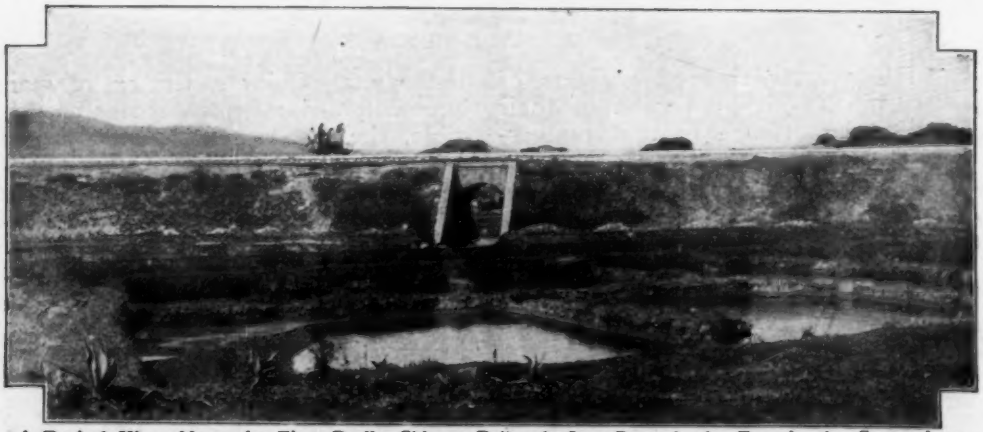
Native Capital, Engineers and Laborers Constructing Line from Amoy to Changchaufu Under Peculiar Conditions

By ARTHUR E. BURRAGE

THE greater railroad projects of China, both by reason of their supreme importance to the commercial development of the Empire and because of the expanded field for financial operations, have so completely engrossed the attention of foreigners that the smaller enterprises have been correspondingly neglected. Among these lesser railways is the Amoy-Changchaufu line. This is one of the first of the 13 railways now being constructed in China on the basis of "everything Chinese." The engineers are Chinese, though foreign trained, the capital, Chinese, the entire management, Chinese, and, so far as possible, the construction materials and rolling-stock, Chinese.

The scheme was first projected in 1906 and took definite form in 1908, when a group of local capitalists secured a charter from the Yuch'uanpu, Ministry of Posts and Communications, in Peking, and became formally organized under the name of the Fuhkien Railway Company. The capital stock of the company is $3,000,000*, divided into 600,000 shares of $5.00 each. The local gentry have subscribed for a

* *All values are given in "Mexican" dollars. One of these dollars is usually worth about 50 cents gold.*



A Typical View Along the First Really Chinese Railroad—Just Beneath the Tree in the Center is a Repaired Grave

The Railroad Station at Sungsu, the Amoy Terminus

A Granite Culvert, Typical of Those Along the Road

The Adz, the Pick, and the Basket, but no Shovel or Scoop
A Deep Cut through an Undulating Section of Country
Chinese Constructing False Work at the End of a Fill

large portion of the stock, any and all being permitted to purchase. The Imperial Government has also purchased a large block. Payments were to be made on the basis of 20 per cent the first year and 40 per cent the second and third years. In order to insure the uninterrupted construction of the road, in addition to paying on its stock, the Chinese Government agreed to loan the company, through the Kao Tung Bank, a government institution, such money as became necessary before the entire capital stock had become paid in; the company agreeing not to negotiate any foreign loan.

The surveyors ran their lines in 1907, actual construction beginning in the following year. Amoy being located on the island of Amoy, it was necessary to locate the terminus on the adjacent mainland, the two to be connected by a ferry when the road is put in operation. Starting at Sungsu, the road runs along the north bank of the Hailing (Sea Dragon) River to Changchaufu, a city of half a million people, situated on the west branch of the Hailing, 100 li* from the coast. The present plans include an extension of 800 li, running southward to Chaochowfu in the province of Kwangtung, where it will connect with the railroad from Swatow and be one link in the future coast line to stretch from Kowloon or Canton to Shanghai. It is also anticipated that the road will be extended farther into the interior of the province of Fuhkien, connecting with the Swatow railroad at or near the place where that road joins the Canton-Hankow railroad.

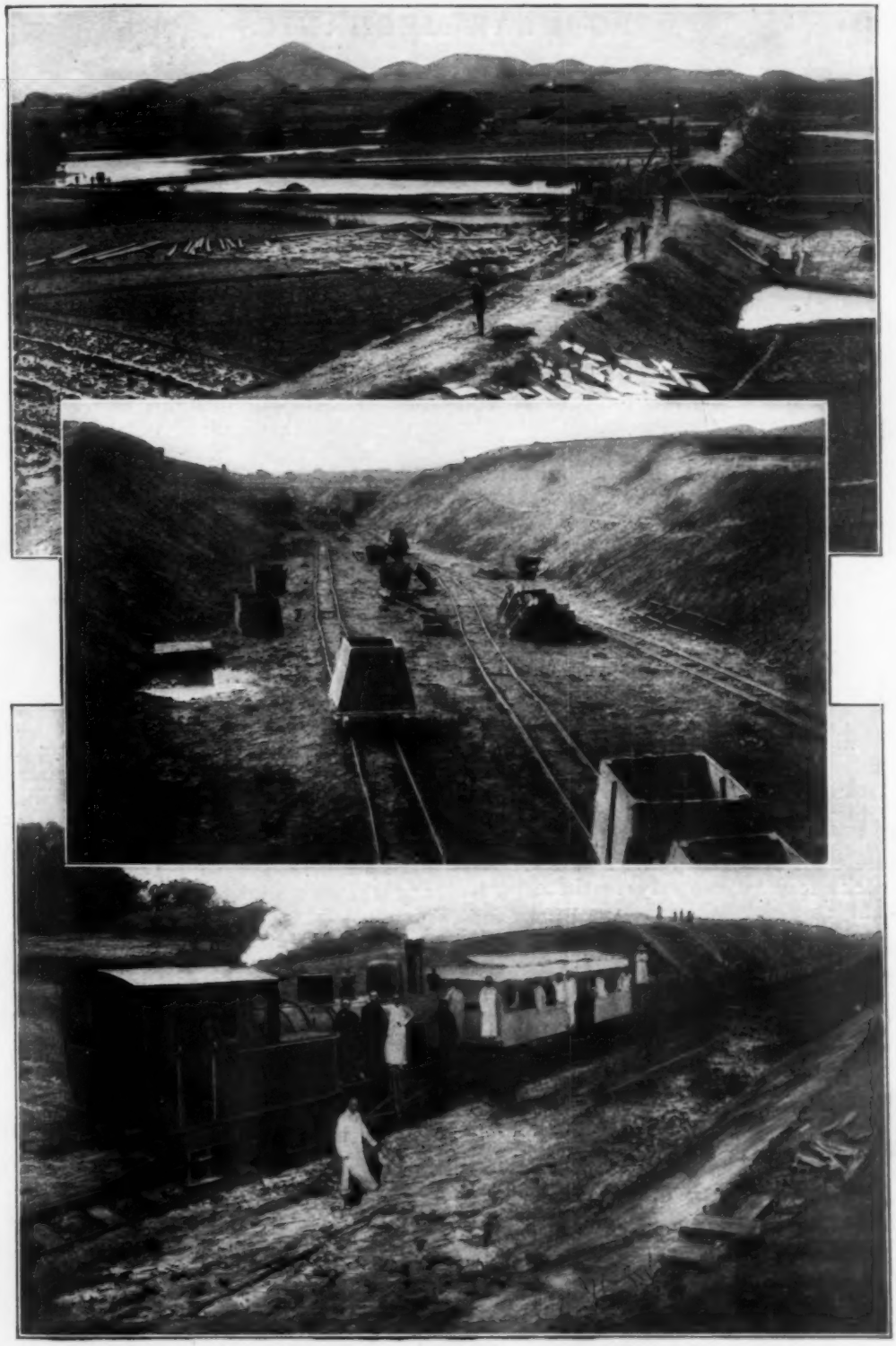
Near the middle of one of the fills there was an example of a peculiar difficulty which a railroad constructor in China must meet. A well-cemented granite culvert arched over what at first appeared to be only a foot path, but closer inspection revealed a well. As the greater portion of the population of China obtains most of its water from the many wells scattered about the villages, the sources of supply are usually carefully guarded. This particular well was dug more than 1000 years ago. It has never run dry and no matter what the condition of the other wells of the village may have been, this well has never been the cause of the least alarm. When the surveyors announced that their plans required the filling of this well, the entire community vehemently remonstrated. The only solution was the granite culvert, greatly augmenting the expense. Such disputes as this are by no means uncommon. In fact, when the road was started, the treasurer of the province appointed an arbiter, whose sole duty is to investigate and adjust all disputes.

The chief engineer, Mr. Wong Hui Nan, was a student at the Arsenal School at Foochow, China, and later studied engineering in France. Returning to China, he became assistant engineer in the construction of the early roads being built in the province of Honan and later became connected with the Peking-Hankow railroad, with which road he was associated when he accepted his present position.

The rolling-stock consists of two locomotives, one German and one American, and eight flat cars bearing the nameplate of a Pennsylvania car works. There are trucks and platforms for others in the yard awaiting assembling, but the passenger cars have not yet arrived. The trucks for these have been made in America, but the entire superstructure will be the work of the Chinese, using foreign designs. They are being constructed at Tung San, province of Chihli, and are expected in Amoy before the close of the present year.

The weary coolie, among his tufts of rice, pauses for a moment as he hears the strange innovation, called "fire-train" in his language, moving on its way. Dotted along the muddy river are a dozen junks, each an element in the commerce of a great delta. Just faintly can we see the patient coolies toiling at the oars, for the wind is low and the great square sails flap idly in the midday calm. Swinging to their sing-song rhythm, these rivermen sway backward and forward, moving their

*A "li" equals 654 yd.



At the Extreme Left of the Upper View Is a Sedan Chair, the Old Mode of Travel in China—A Fill in the Foreground
The Hopper-Shaped Cars Used for Carrying Dirt
A German Locomotive, an Observation Car, and a Load of Dirt on American Flat Cars

heavily-laden craft up or down the river, never seeming to fear the new creation which may some day make their occupation too unprofitable.

On either hand are numberless graves, even jutting out almost to the roadway. These have formed and always will form, so long as ancestor worship endures, a large part of the trials of the Chinese railroad builder. If the descendant be poor, the removal and reburial of the bones and a money consideration, will gain the permission to lay the tracks; but if the present keeper of the ancestral tombs be wealthy, and especially if he be among the influential men of the community, no amount of money will be sufficient to gain the permission to remove the remains. A bridge or a culvert will not aid, a detour only will allow the road to advance. Such is the cause of certain otherwise unexplainable curves in the road.

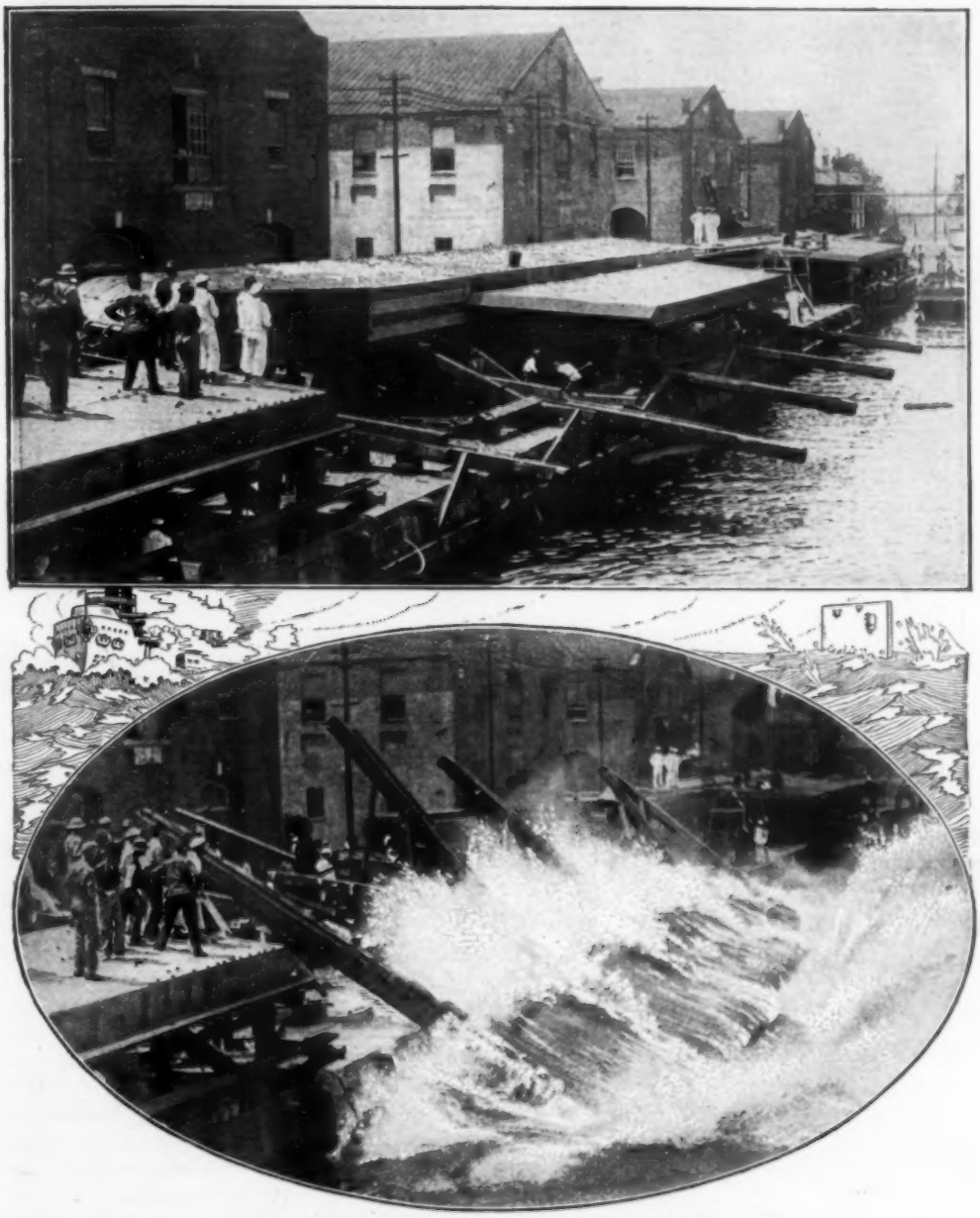
The method of construction of a road in China is exceedingly interesting. There is, here as elsewhere, much cutting and filling to be done, but here there are no steam shovels, no derricks and not even plain hand shovels. China is essentially a land of hand labor. The great cuts along the line were all made by hand labor. A few picks found their way to these parts, but, as a rule, the laborers used a flat tool much like a carpenter's adz, though somewhat longer and broader. This acts as a cutter to cut away the clayey soil and also as a hoe to put the dirt into the little bamboo baskets. The baskets hold about a large spadeful of dirt. The coolie, if the cutting be far from the car or truck, fastens a basket upon either end of his shoulder pole, balances, and then runs, with peculiar, characteristic dog-trot to the car. At times, when there is a great deal to be carried a long distance, the flat cars and the engines have been utilized, but by far the larger portion of the materials has been scooped into these baskets and carried to the little hopper-shaped cars which run on the portable track. The cars are but platforms, 3 ft. wide and 4 ft. long, upon which adjustable hopper-shaped sides are placed. The car having reached the fill, the hopper is lifted from the end and allowed to fall over backward, the contents falling, not as they do from the ordinary "V"-body dump-cars, but rather as from the contractor's adjustable-bottom four-wheeled wagon, directly beneath the car.

When a large mass of rock is to be excavated, powder is used, but instead of convenient, light, industrial derricks to remove the fragments, the coolies continue to work away on the vibration theory until the blocks are in sufficiently small pieces for them to lift and place upon the car. The process may be slow, but it is a question in a land of supremely cheap labor, whether such methods are not the most economical.

When the road was first contemplated, there was apprehension lest the necessary laborers might not be secured. The coolie population in the vicinity of the proposed line had heard the story, which they interpreted literally, that the Union Pacific was built upon the dead bodies of 5,000 laborers. They had also heard that the road had been built, largely, by Chinese labor and they reasoned that the material for making a good roadbed in America would be likely to make equally good material in China. In consternation, they came to an American and inquired about the truth of the story. It was only after a long and patient explanation that it was possible to convince these excited men that the actual facts were at variance with their notions. Today, the 2,000 men drawing their 40 cents a day are not at all worried about becoming eternal sleepers for the road.

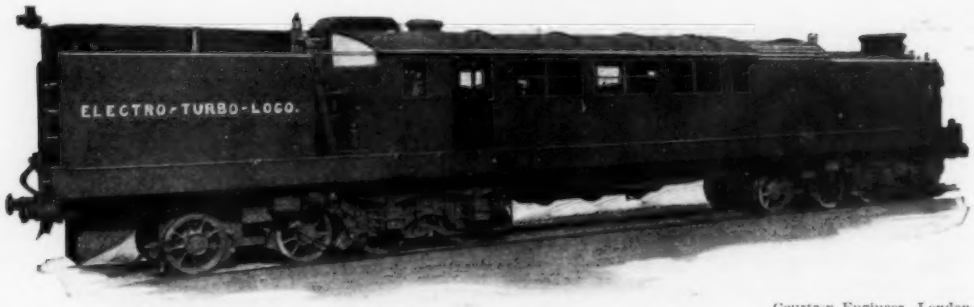
¶Experiments in refrigeration are planned by French scientists at the new station established for the purpose at Chateaurenard. Comparative tests will be made of apparatus from every part of the world.

NEW TYPE OF U. S. NAVY TARGET RAFTS



Target Rafts Under Construction—How They Are Launched

The new type of platforms or rafts for the bearing of the targets at which the U. S. battleships fire in practice are of very solid and formidable construction. They are 150 ft. in length, and 10 ft. wide, having an upper part or deck built of heavy square timbers, strongly bolted together. The bottom part or keel consists of an immense steel tank, resembling to some extent the fin of a



New Combination in Locomotive Power

Courtesy Engineer, London

racing yacht. This tank is filled with pig iron to overcome the great resistance the target screens offer to the wind. The screens, four in number, are suspended from masts rising to a height of 25 ft.

The illustrations show two of the rafts under construction at the Norfolk navy yard, and the launching of one of them. They are built on their side, and are launched by tipping into the water, the inboard side being raised by means of hydraulic jacks.

COMBINED CIGAR-LIGHTER AND GAME OF CHANCE

This donkey cigar-lighter is a game of chance as well as a producer of flame, and was designed for cigar stores. The pack on the back of the animal has a circular hole in the top, and by dropping into this a marble taken from the basket, either the head or tail will be made to waggle. Just which, depends purely on the channel the marble takes.

¶A curious analogy between the plant life found in the Holy Land and in California has been discovered by experts. The flora of Palestine includes about the same number of species as California—3,000.

STEAM TURBINE-ELECTRIC LOCOMOTIVE

This new type of locomotive, built for the Reid-Ramsay railroad system in Glasgow, Scotland, and recently tried out, is driven by electric motor, the power for which is generated by a steam turbine.

Steam is generated in a boiler of the ordinary locomotive type, fitted with a superheater. The coal and water supply are carried in side bunkers and tanks, located along each side of the boiler. The steam from the boiler is led to a turbine, which runs at a speed of 3,000 revolutions per minute, and to this is directly coupled a continuous-current variable-voltage dynamo. The dynamo supplies current and pressures varying from 200 to 600 volts to four traction motors, the armatures of which are built on the four driving axles of the locomotive.

The exhaust steam from the turbine passes into an ejector condenser, and is, together with the circulating condensing water, delivered eventually to the hotwell. As the steam turbine requires no internal lubrication, the water of condensation is free from oil. The water evaporated by the boiler is therefore returned to the boiler again and again, and the water carried in the tank is actually circulating water for condensation purposes. The condensation of the exhaust steam deprives the locomotive boiler of the usual exhaust blast which induces the draught through the fire-box and boiler tubes, but the induced draught is replaced by forced draught provided by a small turbine-driven fan.

UNITED STATES ARMY SEARCHLIGHT AUTO

Motor searchlights of both the English and French armies were described and illustrated in the August issue, while this article deals with the monster searchlight just acquired by the United States army. Like the foreign war vehicles of the same kind it will be used for spying out the enemy at night, both land and aerial fighters, but especially the latter.

Ready for action, the machine will weigh 10,500 lb., yet it will be able to negotiate a 25 per cent grade, travel 16 miles an hour, be run over soft ground, and climb over such obstacles as 10-in. logs.

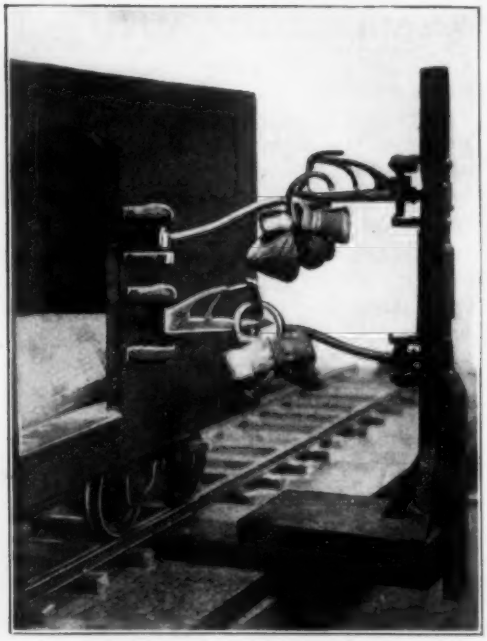
The power and method of applying it, although described in this magazine as used on heavy traffic trucks, is unique for army service. The power is electricity, supplied to the motors from a storage battery, or generator, operated in turn by a gasoline engine. Each wheel is self-contained. That is, there is a motor in every wheel, making each one a driving wheel, while all four steer simultaneously. The same plant that furnishes power for propulsion, also furnishes a sufficiently powerful supply of current for two large searchlights, the rays of which will penetrate the darkness for a distance of several miles.

Each wheel of the truck has a knuckle joint, which enables the operator to turn the car in a complete circle in a space having a diameter but little larger than its length. The wheel casings, which contain the motors, are waterproof as well as dustproof.

Monstor Motor Searchlight of United States Army

ILLUMINATED PROJECTILES

That the ability to trace the flight of shells during night firing would be of great benefit for correcting ranges has led the British army to make experiments with means of providing such projectiles with illumination. At Fort Albert, on the Isle of Wight, tests have been made recently in connection with 12-lb. guns of an invention that proves very satisfactory. It consists of a metal cylinder containing a powerful illuminant, and is screwed to the base of the shell. The illuminant is fired by the explosion, and burns brightly during the flight of the shell.



A Promising Mail-Transfer Apparatus

"GIVE AND TAKE" MAIL-CATCHING APPARATUS

A new bag exchange system for mail cars in transit, which has been given a test on the Illinois Central Railroad, is based on the use of pivoted arms. The apparatus is of the "give and take" type, and the exchange of bags is made by pivoted arms that release and catch the rings to which the bundles of bags are attached.

Fastened to the door of the mail car is an arm for delivering the pouches and a grasping device for receiving them. The bundle of pouches to be delivered from the car is strapped to a ring which is provided with a short spur that fits into the end of the delivering arm. As the car passes the station, the ring is caught by the grasping device on the post, the spur pulls out of the delivering arm, and the bundle of pouches is left behind. In receiving mail on the car, the same process is carried out, except that the action is reversed. Both the delivery and receipt of mail is accomplished simultaneously and without jar, a sharp click indicating the accomplishment of the transfer.

SINGING TAUGHT IN SCHOOL BY PHONOGRAPH

The children of Public School 147, Brooklyn, are taught proper tone and expression by listening to a phonograph installed for this purpose. The song being taught is written on the blackboard, the music studied, and then a record of it is played. The pupils listen to get the tone and expression; then it is played a second time, the pupils accompanying, singing softly; after which the phonograph is stopped and the song is sung from the music on the board.

AN ARTFUL INTERIOR-DECORATION ILLUSION

A person walking into this foyer of a New York restaurant would be surprised if told that the central feature of the decoration scheme was only half there and the rest an illusion, yet this is the fact. What appears to be a globe and table are each but half a table and half a globe, the other half, together with the rear wall, being supplied by the mirrored reflection. The mirrors are so artfully disposed that no joining is apparent.

Courtesy Upholsterer

Excellent Mirror Illusion

AUTOMOBILES BLAMED FOR SPREADING TETANUS

It is suggested by the British Medical Journal, that the extraordinary increase of tetanus in that country is due to the automobile, although the first thought is that the development of the horseless vehicle would have had just the opposite effect. But it is believed now that the distribution of the germs has been greatly increased by the dust-raising powers of the automobile.

In 1901 the number of deaths in England and Wales from tetanus was 57.

In 1902 an extraordinary increase occurred, the deaths being 201. In 1903 the deaths were 257, and the rate remained above the 200 figure until 1908, when it receded to 180.

NEST ON TOP OF STREET LAMP

The top of an arc lamp is not the best place in the world for a bird's nest, yet two sparrows, in search of a site for a home, selected just such a place, as is here shown. They built the nest right on top of the live terminals, and inside the resistance frame. In this position it was sheltered from wind and rain, and warmed by the resistance. Young birds were in the nest when discovered.

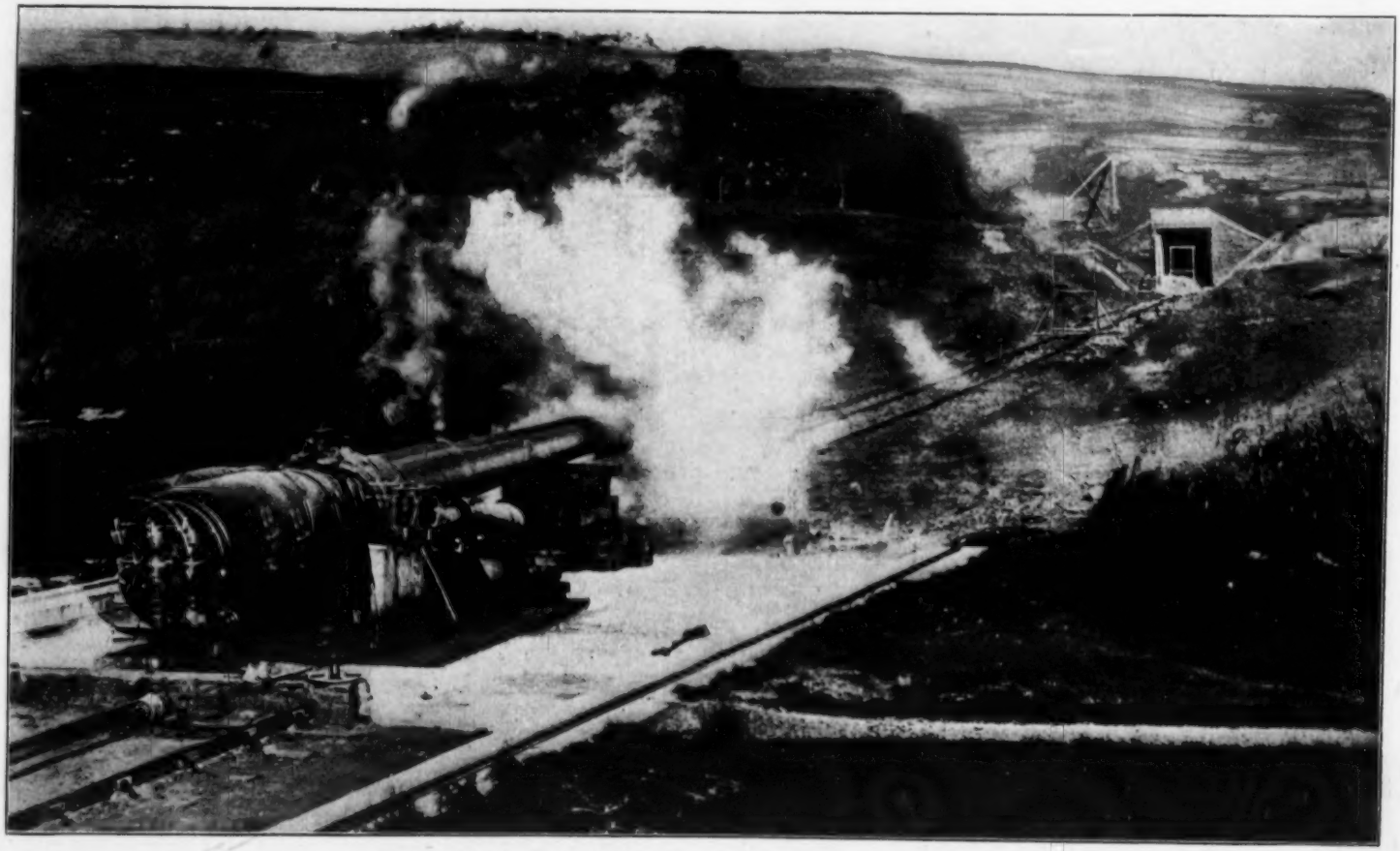
Sparrow's Nest in Arc Lamp

Built on Top of Live Terminals

FOREIGN BODIES LODGING IN THE HEART

The astonishing tolerance of the heart for a foreign body loose in its interior is remarkable. Pointed objects, however, generally work into the heart wall and cause such disturbances that an operation to remove them is justified.

Dr. D. G. Zesas, of Leipsic, has found 118 cases on record of foreign bodies in the heart. In these, 54 of the intruding objects were needles, 38 were bullets, and among the others were nails, a thorn, a gold plate, an iron peg, a splinter of wood, and a hairpin. In 12 cases the foreign body had reached the heart from the alimentary canal, in four cases through the blood vessels, and once by the air passages, while in 96 cases the entrance was by propulsion through the chest wall.



Photographic Image of Gun Vibration—Note Movement of Gun in Recoil

THE VIBRATION OF BIG GUNS

The movement of a 12-in. gun, caused by the explosion of the monster charge required to hurl the heavy projectile, is graphically shown in this illustration. The gun was photographed just before firing and then another exposure was made on the same plate at the moment the gun was discharged. The difference in the two images denotes the extent of the vibration. Another interesting feature of the illustration is the fact that somewhere within it, between the muzzle of the gun and the right margin, the projectile is rushing along its course. Had it reached its destination, the right side of the illustration would be a cloud of sand.

The tests were made at the Ridsdale proving ground of the Armstrong Company, in the middle of Northumberland, England.

UNIVERSITY HAS GRADUATE COURSE IN HOUSE DECORATION

The Teachers' College of Columbia University has a course in practical house decorative study, the successful graduates from which receive a diploma. The preparation for this diploma requires two years' study at the Teachers' College, followed by an additional year of practical work with professional decorators under the supervision of the college instructors.

The studies include art appreciation, the history of art, history and principles of design, design drawing and painting, mechanical drawing, clay modeling, house decoration and furnishing, and construction.

IRON SERVING MAN

Quaintly fashioned iron waiters, patterned after the black-coated servant in human form, have come into vogue in England, having been brought into that country from Germany, where they were invented. These iron serving men carry trays on which are placed cigars, cigarettes, matches, coffee and liquors, from which patrons of hotels and cafes may help themselves. The iron men are placed in halls, and lounging and smoking rooms. They stand on pedestals and have casters so that they may be wheeled about. They are so light that a man can carry one under each arm.

He Never Accepts Tips

Watermelon Shed at Picnic Given by Southern Mill Owner to 16,000 Employes and Friends—A Car Load of Melons Was One Item on the Menu

How a Mill Owner in the South Creates Efficiency and Contentment in His Employes

THE human asset is looming larger and larger in the industrial field. That the care and attention shown the engines and machines, the sums paid out for protection against loss by fire or other catastrophe form but a part of the insurance of any well organized plant against decreased dividends and depleted capital, is now almost universally recognized. The progress that has been made in this direction, during the past few years, however, and the extent to which the employers of labor have realized their responsibilities

The Egg Boiler—18,000 Eggs Were Boiled and Served to the Picnickers

forms a chapter of industrial history that has been but lightly touched upon.

Throughout the South there are hundreds of men and women working solely to improve the condition of the human asset in the country's commerce. While a number of these welfare workers are the agents of societies organized for the purpose, by far the larger portion of them are the employes of the manufacturers, and are engaged for the purpose of keeping the laborer at the looms or in the mines happy, contented and prosperous for the same reason that a competent engineer is engaged to keep the engines running smoothly and the bearings properly packed. There is no philanthropy in this work. It is purely a business proposition for the men who have done it, and the material profits

A Four-Room House Which Rents for $3 a Month

Scene at Picnic Given to Mill Employes—Caesar Cone Making Address

The $25,000 School Building, Constructed and Largely Maintained by White Oaks Mills

of the system have been great enough to prove its practicability.

A leader in the movement for better labor by creating better conditions under which the laborers work, whose system is typical of those of many other mills and factories, is Caesar Cone of Greensboro, N. C. Mr. Cone is the head of a concern that owns and operates three large mills for the production of denim and canton flannel. He has 3,800 employes on his payrolls and 10,000 people are supported by the labor. His first step in the plans he and his brother, the late Moses Cone, made for the advancement of the workers' interests, took the form of constructing sanitary and attractive homes. There are several classes of these buildings, renting for from $3 to $5 per month and having from four to six rooms. Each house has its little garden plot and prizes are offered the householders who make the most attractive flower gardens, the best vegetable gardens and the best lawns. At each of the three mills is a school building, a corps of 30 competent teachers being in the employ of the company to give proper instruction to the children. At the White Oaks Mills the schoolhouse cost the firm $25,000. Welfare workers have organized cooking and sewing classes and classes for instructing mothers in the care of small children. Each mill settlement has a library which also supplies a place of recreation equipped with games of all sorts. There are gymnasiums and baths.

These necessary things constitute only a part of the investment the Cone interests make in humanity. There are numerous little celebrations of more or less elaborate character and at Christmas and on the Fourth of July the entire corps of employes and their families in each of the three mills are inoculated with the holiday spirit at the expense of the employers. Each family receives a load of wood or a turkey on Christmas day and money prizes are presented for faithful attendance at the mills. A big Christmas tree is erected in one of the mills and all of the children receive presents.

Every summer a big picnic is given and all the employes and their families are invited to attend. At the picnic held recently there were nearly 16,000 people present. The entire day was spent in enjoyment at the expense of Mr. Cone. He supplied a spread which was served by 150 waiters and included 10,000 frankfurter sausages, 18,000 boiled eggs, 10,000 buns, 10,000 sweet cakes, 10,000 sour pickles, 10,000 sweet pickles, 5,000 bags roasted peanuts, 10,000 slices watermelon, 1,000 muskmelons, 2,000 pineapples, 10,000 peaches, 40,000 bananas, 1,000 gal. lemonade and 25,000 saucers ice cream. There were three band concerts and a vaudeville performance during the day. The bands were made up of employes of the mills and the performers in the vaudeville were professionals hired for the occasion. In the afternoon there was a big meeting when Mr. Cone and his chief lieutenants made addresses and $500 in prizes was distributed among the workers.

Asked if all this expenditure pays, Mr. Cone points to the fact that he and his brothers have never had a single labor disturbance in the history of their enterprise. They started in the manufacturing business in Greensboro 20 years ago and now have one of the largest plants in the country. Their big mills have never been idle a day.

THE ADVERTISING OF AERIAL CRAFT

One cannot help but wonder in looking through the advertising sections of the magazines at the stupendous amount of space, costing millions of dollars a year, utilized by the various automobile and attendant concerns, yet

MONOPLANS
HANRIOT Company Ltd
34 Rue des Moulins REIMS
Cet appareil monté par le pilote LOUIS WAGNER a exécuté le 10 MAI plusieurs vols magnifiques dont 1 avec 3 passagers sur l'AERODROME de la CHAMPAGNE.
LES AÉROPLANES DE LA MARQUE HANRIOT SONT VENDUS PAR LA
BANQUE GÉNÉRALE
DE L'INDUSTRIE AUTOMOBILE
ET DE L'AVIATION
74 Bd HAUSSMANN
PARIS
AGENTS EXCLUSIFS POUR LE DÉPARTEMENT DE LA SEINE
TÉLÉPHONE 168-15
TÉLÉGR. MOTORBANK
Pour les essais de pilotage qui sont donnés sur l'AERODROME de la CHAMPAGNE s'adresser au "MONOPLAN HANRIOT" 34, Rue des Moulins à REIMS ou au siège de l'AERODROME, 17 B de la République REIMS

Aeroplane Advertisements in a French Weekly

it is foretold by many who have their eye upon the future that aerial craft will be advertised just as strenuously within a few years.

As yet, in this country, such advertising is mostly confined to magazines dealing with aerial developments alone, but in Europe, and especially France, space is being bought in weekly and monthly magazines of the general order. Examples are shown in these reproductions of three advertisements which appear in the foremost French weekly, "L'Illustration."

THE WOMAN AND THE CAR

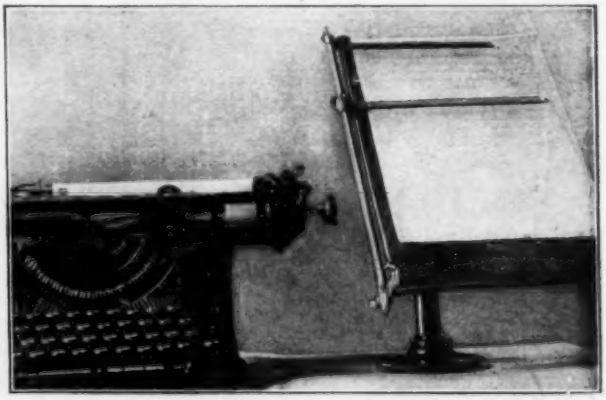
Repairing a Puncture

A year or so ago a light weight type of automobile known as a "gentleman's roadster" made its appearance and was hailed with favor, but the name has now ceased to be appropriate, as such cars, through recent developments in automobile simplicity, are ideal for women's use.

In the illustration a woman owner of such a car is busy repairing a puncture, and seems to be enjoying it. The majority of women auto owners are fairly good mechanics.

COPY-HOLDER WITH LINE INDICATOR

This holder for copy for stenographers differs from the ordinary device for the purpose in that it is provided with a line indicator. When the typist reaches the end of a line in reading the copy, a key, similar to one of the typewriter keys, is touched and the indicator drops to the margin under the next line, where it is held by a stop.



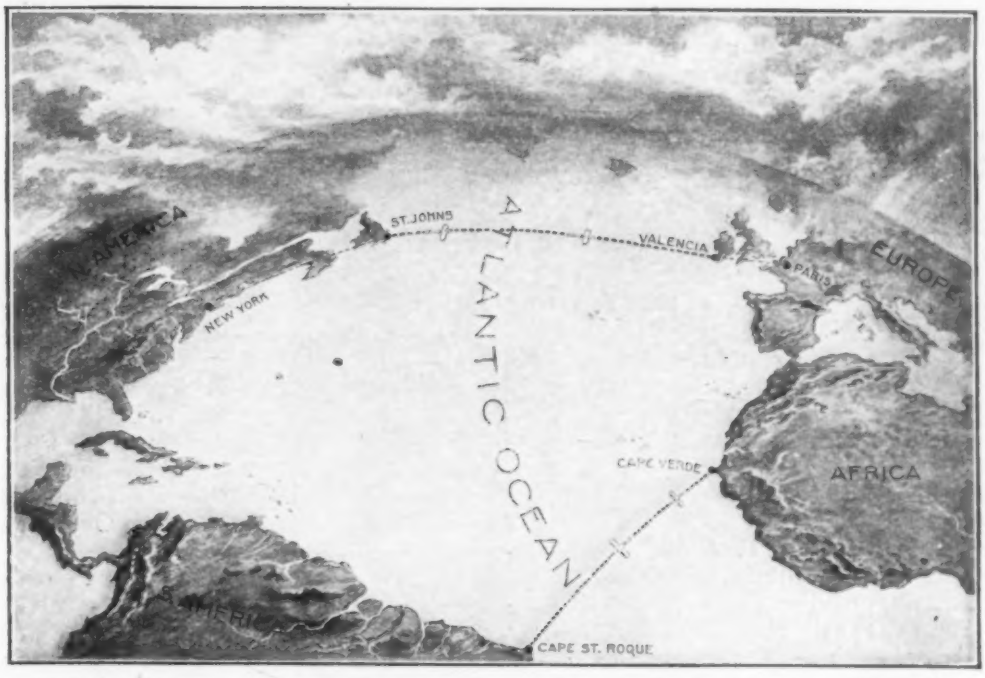
An Improved Copy-Holder

¶After months of discussion and experiment, the French government has decided not to adopt aluminum coinage because it is too light and will slip through the fingers unnoticed. Experiments are now being conducted with bronze containing 10 per cent of aluminum, which, if adopted, would reduce the weight of coins about one-half.

¶A municipal dry dock, 1,000 ft. long, has been proposed for New York.

GROWTH OF THE WORLD'S SHIPPING

The total tonnage of the world's shipping is now 41,915,000 tons, of which 37,291,000 is steam, and 4,624,000 sail. The growth in shipping from 1886 to 1910, and the supremacy of steam over sail, are shown by the following figures: In 1886 the tonnage of sailing vessels was 11,217,000, and of steam vessels 10,291,000. In 1900 the steam tonnage was 22,369,000 and the sailing-vessel tonnage 6,674,000.



Shortest Routes for a Transatlantic Flight—The Distance by the Northern Route Is 1,760 Miles and by the Southern Route About 1,800 Miles

ACROSS THE ATLANTIC IN AN AEROPLANE

By VICTOR LOUGHEED

Author of "Vehicles of the Air"

NEVER in the history of mankind has an improvement in transportation or progress in a mechanism appeared so suddenly or developed so fast and so utterly unexpectedly as has the aeroplane. Born while the world was looking the other way, and nurtured in a cradle of skepticism, the new vehicle of the skies has been minimized, poohpoohed, and jeered at, by savants and laymen alike. The result has been that an amazed world has had fairly sprung upon it, quite in the face of doubt and disbelief, the most astounding spectacle of the ages—the wildest dream of the dreamers come true, for centuries upon centuries the very synonym of all that was extreme and impossible—the man-bird, at last, full-fledged, with his self-built pinions of steel and wood and fabric, mounting triumphantly into the blue in ever-increasing numbers. Flying for hundreds of miles and for hours upon hours, cutting evolutions with the grace of the gull and gliding with the sweep of the eagle, beginning close to the ground, over level areas, and then daring to mount to the cloudland realms of the condor, he has piled record upon record and achievement upon achievement.

What yesterday was a feat proclaimed the world over, is today unnoticed and commonplace. It is accepted fact that men fly, surely and boldly, and with increasing safety, even though they pay with the martyrdom of an occasional life for some particularly hard or especially needed lesson. It remains no longer to establish the mere ability to fly; the question now is the probable measure of the practical limits and values of man-flight in the reasonably near future.

It is little more than a year since Bleriot's crossing of the English channel riveted the attention of the wondering nations. Since then the same span of water has been successfully crossed four times, the last crossing having been a mere incident in Moissant's trip from Paris to London. A year ago the record altitude achieved by an aeroplane was less than a thousand feet. Since then two machines have mounted over a mile into the clouds, and any number have broken last year's record. A year ago the record distance for a single flight was 118 miles, made at an average speed of 39 miles an hour. Since then a dozen men have beaten this record, and one has flown 250 miles in five hours, with a type of machine that has traveled at 74 miles an hour for shorter distances. And at least 300 men have flown over an hour.

Gnome-Bleriot Carrying Three Passengers

To sum up, so great has been the progress that it quite taxes the imagination of the prophet who dares predict even the next step forward, but it is at least fairly safe to suggest that the next great flight which is destined fully to awaken even the most skeptical of mankind will be a crossing of the Atlantic Ocean by aeroplane.

How close to realization such a flight really is, is perhaps appreciated only by the very few engineers who are most closely in touch with the present status of aeroplane development.

To bring more lucidly to the lay reader's mind the true measure of the suggested project, a few figures will be necessary.

To begin with, it probably will help visualize the idea to regard such a flight not so much as a matter of distance as it is a matter of time. The speed of even the fastest water craft being comparatively slow as measured against either land or aerial vehicles, the generality of mankind has the men-

Tiny Monoplane with which Moissant Flew from Paris to Within a Few Miles of London. The Span of this Machine is Only 20 Inches, its Weight with Operator, in the Neighborhood of 500 Pounds, and it is Propelled by a 50-Horsepower Gnome Motor

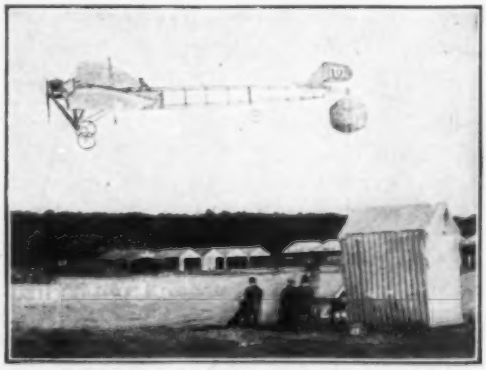
tal habit of regarding a five-day crossing of the Atlantic Ocean as something phenomenally fast. But when it is realized that from St. Johns, Newfoundland, to Valencia Cape, Ireland, is a distance of less than 1,800 miles, and that 50 miles an hour already has become a common average speed for aeroplanes—with the likelihood that average speeds of 60 to 100 miles an hour will be easily maintained within the next year or so—immediately a new aspect is placed upon the situation.

New Type Bleriot Monoplane, Which, Fitted with a Gnome Motor, Has Flown at a Speed of 74 Miles per Hour.

Incidentally it is to be remarked that from Cape Verde, Africa, to Cape St. Rogue, South America, is also a distance of about 1,800 miles, and that these two possible lines of travel for the transatlantic airship are only about half the length of the routes commonly taken by steamers. It also is to be remarked that, unlike land vehicles, the maximum speed of air craft like those of water craft are their average speeds, the unending uniformity of the aerial and the liquid oceans being in sharp contrast to the varying topography of the solid ground, which even with the best roads and railroads holds down the average speed of land vehicles despite the wonderful spurts that have been made for short distances on perfect highways, specially routed. Hence, with the quite evidently available speed of 60 miles or more an hour, it is clear that a crossing of the Atlantic, involving a flight of only 1,800 miles, if made under favorable conditions can demand only from 18 to 30 hours' continued operation of the motor. With a favoring wind—and at certain times of the year the trade winds blow very reliably and with great uniformity from East to West—it is quite possible that some 40 miles an hour at least could be added to the speed of the vehicle, which would thus reduce the time to from 13 to 18 hours—a period short enough for a single operator of ordinary physical endurance to stand the strain without relief, though perhaps two operators would be a more practical proposition.

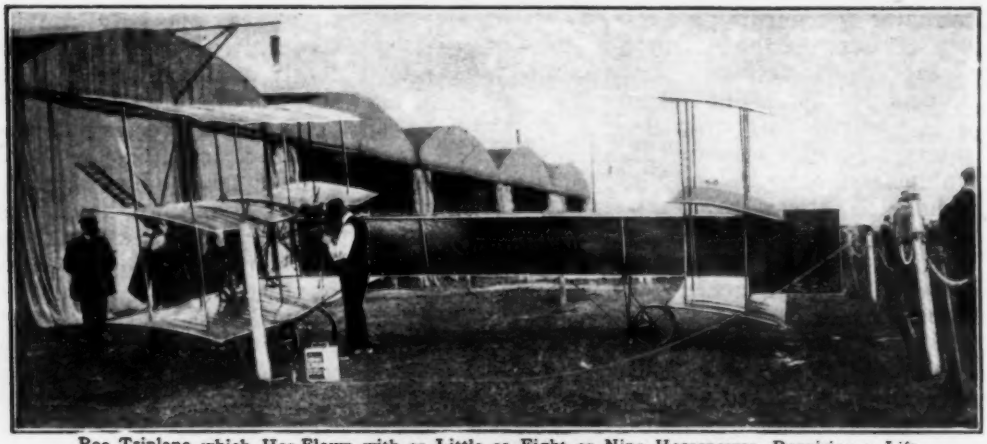
Olieslaegers in the "Bleriot," with Which He Holds the World's Distance and Duration Record for Single Flight—243 Miles in Five Hours, Four Minutes.

A point has been made so far, of premising all of the foregoing substantially upon the prospects of present-day machines, and such future development as is unquestionably to come will further simplify the problem.



Tellier Monoplane in Flight. This Machine, Which Resembles the "Bleriot," is Driven by a Panhard Motor, Consuming .6 Pt. Gasoline per Hp. Hour.

The interrelated questions of fuel capacity and of flying radius without a descent for fuel supplies can be best disposed of by a consideration of these factors in machines already built and flown. For example—to prem-



Roe Triplane, which Has Flown with as Little as Eight or Nine Horsepower, Requiring a Lift of Fully 75 Pounds to the Horsepower

ise a sort of hypothetical composite of these—it is to be noted that the Roe triplane of England lifts 75 lb. per horsepower; that the Panhard motors used in the Tellier monoplane consume only .6 pint of gasoline per horsepower per hour; that the reserve capacity of the Sommer and Breguet four-passenger biplanes is in the neighborhood of 400 lb. in addition to the weight of the machine and operator; and that the speed of the 100-hp. Gnome-Bleriot monoplane is 74 miles an hour.

That we are on the road to great improvement in the way of aeroplane efficiencies is not to be doubted, inasmuch as the birds carry at higher speeds tremendously greater weights in proportion to their power than is as yet carried by the man-built machines. Probably by the application of the more deeply curved wing surfaces of the birds—a type now known to have the greatest lifting values, but the correct and safe use of which is so little understood by even the most successful aeroplane builders that most present development is in the direction of flatter surfaces—there is every likelihood that present speeds and sustentions will be maintained with decreasing power. This helps in two ways. In the first place, less power means a lighter engine, permitting the addition of a few pounds for what is at present a much-needed increase in reliability—such, for example, as the reasonable assurance that an engine will run without attention as long as it is supplied with fuel and oil. Besides this, such weight as may be shaved off the power plant constitutes an additional reserve capacity for carrying fuel, while the less power developed involves a lower rate of fuel consumption.

Let it be assumed, then, that a machine weighing 600 lb. (approximately the weight of the four-passenger Sommer and Breguet biplanes) can be built possessing the ability to carry 400 lb. in addition to the weight of itself and one operator, and with only 16 hp. can fly as fast as the Gnome-Bleriot requiring a lift of 75 lb. per horsepower, as in the case of the previously mentioned Roe triplane. With the same efficiency as that of the Panhard motors, at .6 pint of fuel per horsepower per hour this motor will require only 9.6 pints to run it for an hour. This amount of fuel weighing about 13 lb., the reserve capacity of 400 lb. would allow enough fuel to run the motor for 30 hours—quite long enough to cross the Atlantic on the face of the figures already given, even if somewhat less than the maximum speed that appears possible is maintained.

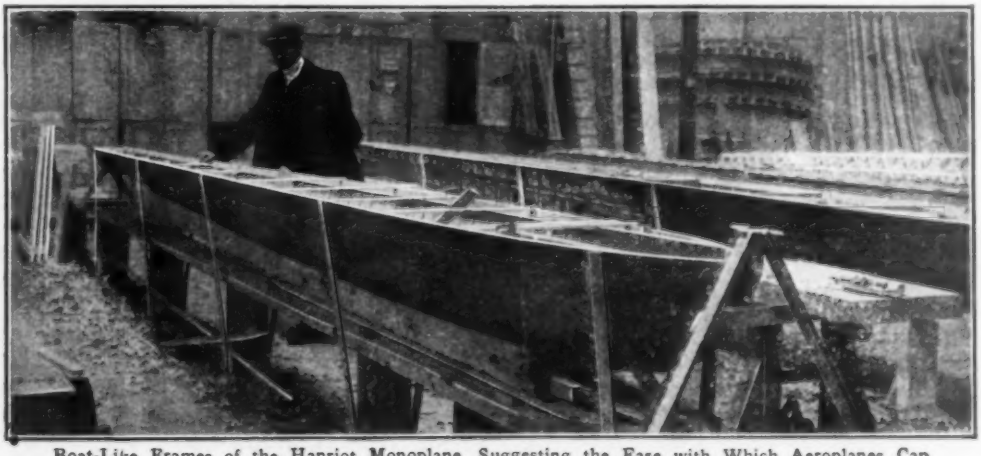
The amount of oil required may range from as little as one-twentieth to as much as one-half the fuel consumed, but as the lower figure is more probable with good engines, this is not a very serious consideration.

In the matter of water cooling versus air cooling, the much greater weight of the former, as well as the excellent results that have been secured with air-cooled motors, seem wholly to condemn the former, in so far as any really important future development is concerned.

The several factors that have not been specially regarded in this consideration so far are rather more likely to develop favorably than unfavorably. The possibility of taking advantage of the trade winds has been mentioned, but the possibility that vastly greater additional speeds may be gained in this way is one that, while not capable of proof, is quite possibly existent. In the course of kite-flying experiments, enormously high and remarkably steady wind velocities have been determined to exist in the attenuated atmosphere at great altitudes, kites flown three miles high having recorded winds blowing at velocities as great as 225 miles an hour. At such a height, the atmosphere weighs fully five-eighths what it weighs at sea level, so the loss in sustention is not too serious to be overcome with machines of sufficient area, while the lower resistance of this lighter air might facilitate enough greater speed to make up for the loss in sustention.

Who, then, can say that some Columbus of the air, who within the next couple of years will accomplish this prodigious feat of flying, may not jockey his craft into one of these intercontinental air currents far above the earth's surface, and add to the velocity of a vastly improved machine an atmospheric drift that may make the greatest speeds of travel now known seem by comparison mere crawling.

So far it has been assumed that the flight must be made without stop, a basis upon which a most absolute engine reliability and efficiency, with a reserve capacity to carry a great quantity of fuel, will be demanded. But even at this there still remains the fact that men already have flown for five hours uninterruptedly with the best present-day aviation motors, with never a missed explosion. Another way of appraising the required reliability is to consider the required number of engine revolutions. Modern aerial propellers averaging 5 ft. of advance through the air for each revolution of the engine crankshaft upon which they are commonly mounted, a distance of 1,800 miles requires 1,800,000 revolutions of such a propeller for its accomplishment. There are many automobile motors, even of fairly light weight, which have proved quite capable of running 10,000,000 revolutions without adjustment and even without stopping, if proper care is taken of the fuel and oil supplies.



Boat-Like Frames of the Hanriot Monoplane, Suggesting the Ease with Which Aeroplanes Can Be Built to Land Upon and Float On the Water for an Indefinite Period

The idea of plural engines or plural propellers is a possible road to improved reliability, though the latter seems less necessary than the former.

The necessity for a non-stop flight, however, seems materially less than it did appear until recently, for it is a new feature of aeroplane development that a machine has been built by Fabre, one of the less well-known French engineers working on the problem, which has repeatedly proved its ability to start from or land upon any fairly calm water surface—floats in the form of miniature hydroplane boats being substituted for the usual running or alighting gear. Another way of eliminating the necessity for a non-stop flight might be found in the provision of a series of boat patrols, which might serve as means of restarting the aeroplane. If 34 boats, probably on the order of the common lightships used along rough and stormy coasts, were strung out along the course, the distance from each of these to the next, about 50 miles, would enable the aviator to keep one or another in sight all the way, which would be of great advantage in that it would enable him to keep to a course that would be hard to determine by means of a compass—which though it shows the different directions, does not constitute a means of allowing for such lateral drift as might easily take place through an angular movement of the mass of the atmosphere quite unknown to the aeroplane pilot, who feels no wind but that due to the progress of his machine through the air.

The time to select for an attempt at a transatlantic aeroplane record probably would be late in August or in September, when moonlight nights could be added to days of 18 hours' duration (if the Northern route were selected).

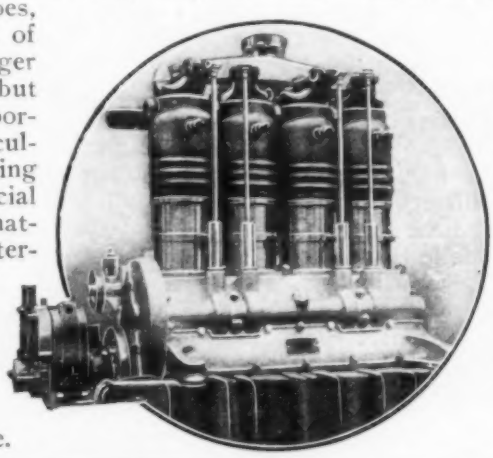
The danger is far less than might be imagined. If desired, such is the uniformity of water surface, the entire flight might be accomplished at a height not to exceed 10 or 20 ft. from the water, and thus a landing upon the water would involve no immediate fatality, since if the machine were specially built for the purpose, it could be easily made to constitute an excellent raft, upon which a hardy individual could exist for days while waiting to be picked up. Hubert Latham's first descent into the English channel, from which he was picked up by a torpedo boat without even having his feet wet, is significant in this connection. It is even well within the possibilities of early development that a deliberate descent might be made upon the water at intervals and, after refilling of the tank, the aeroplane relaunched for a further lap of the journey from the flat forward deck of a specially prepared vessel, capable of running into the wind at fair speed or else provided with a spring or weight starting device analogous to that formerly used for getting the Wright aeroplanes under way. Of course, it is to be remembered that all modern aeroplanes constitute safe and controllable gliders from any height, with motors stopped.

In any event, it is safe to assume that the pioneer who first attempts to cross the Atlantic by aeroplane may depend upon it that the navies of nearly all the nations of the earth will patrol the waters in a search for him in the case of mishap—a prospect that must prove far more encouraging than any that presents itself to the ordinary shipwrecked mariner.

The question of the number of passengers in the initial flight is an important one. From some standpoints two must be evidently better than one, since this would mean alternation at the controls, the possible ability to give a certain amount of attention to the motor, and in every way a far less taxing strain upon the operator. But the question of fuel capacity may have to be considered above everything else, and the ability to carry an extra 16 or 20 gal. of gasoline might have to take precedence over all else.

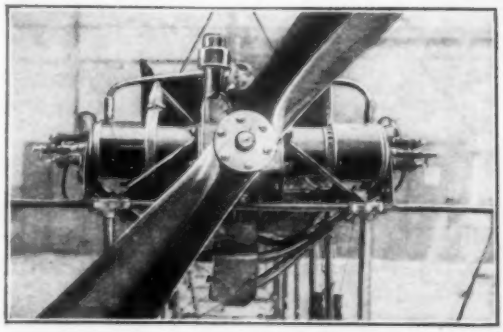
The value of such a flight to the world is beyond computation. At first certain to be regarded as no more than a wonderful stunt, accomplished by some death-defying daredevil who has the courage to place his life in the bal-

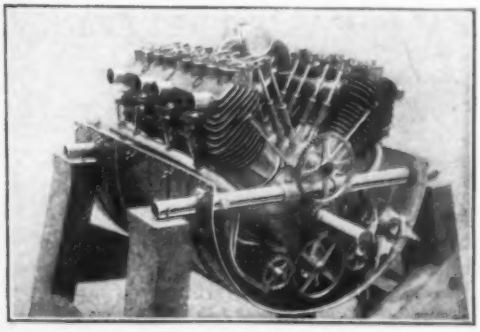
ance against honors and rewards, the ultimate result must be that from the inevitable repetitions of the flight a great commercial utility must grow. It is quite likely that this utility may not soon, if it ever does, assume the form of regular passenger transportation, but think of the importance—the incalculable value—of being able to whirl special classes of mail matter at frequent intervals from one continent to the other in a period of hours instead of days, even if nothing further were done.



The equipment necessary for the maintenance of such a service will be any number of times less expensive than is required by the transatlantic steamship companies, or even by the cable companies.

Probably a series of small, slow and inexpensive, but very seaworthy patrol steamers would be the first essential to maintain, stationed at close and regular intervals from one shore to the other. All that would needs be added to these would be a small fleet of aeroplanes—anywhere from a dozen to a hundred—which could be dispatched at regular intervals in both directions. With developments in wireless telegraphy, it might easily prove possible to maintain constant communication between the aeroplanes and the patrol boats, and thus all the way from land to land, and the only recurring type of accident likely would be the decreasingly frequent involuntary descents upon the water compelled by engine failure. These would be quickly discovered by the passing of one patrol boat by the aeroplane and its failure to





A GROUP OF EUROPEAN AVIATION MOTORS

Upper View—A Panhard Motor Used on the Tellier Machines; Left-Hand View—Horizontal Opposed Darracq Motor, Developing 25-30 Horsepower, Weighing Only 66 Pounds, with Which Some of the Most Successful Santos-Dumont Machines Were Equipped; Right-Hand View—An Eight-Cylinder, V-Shaped Flat Aviation Motor, 50 Horsepower Developed with 110 Pounds' Weight; Lower View—A 16-Cylinder 100-Horsepower, V-Shaped Motor That Was Fitted to Some of the Antoinette Monoplanes.

appear on schedule at the next. Then another aeroplane or two could be sent out to circle around until their foundered fellow were located, whereupon the nearest patrol boat would be called to pick it up. Even should it prove impracticable to maintain such a service regularly during the colder and more stormy seasons of the year, the extent to which it could be maintained would still afford a great, and once civilization had become habituated to it, an indispensable utility.

It is easy to apprehend the many objections that can be made to this anticipation of the future, in which only a very few may have any serious faith at the present time, but it is the lesson of mechanical history that the ignorance of the many, and their ridicule of what they are unable to understand, never for a moment retards progress. Eighty years ago the railroad train—60 years ago the steamboat—30 years ago the bicycle—15 years ago the automobile—were jokes in the eyes of the multitude. Now they are common conveniences of civilization, availed of by every one. Today it is the aeroplane that is the jest of the prosaic minds that vegetate through life while contributing nothing to the sum of human progress. Tomorrow it will be this same wonderful ship of the skies, which now stirs the enthusiasms of the farseeing few only, that will take its settled place in the scheme of things—another contribution from the genius of the race to the masses of mankind. Thus does history unfailingly repeat itself.

PARIS PREPARING FOR FUTURE FLOODS

The havoc caused in Paris during the early part of this year by floods resulted in the appointment of a commission to investigate and adopt measures to prevent a recurrence of the disaster. The report of this commission, the engineering plans of which will probably be carried out to the letter, provides for the widening of the smaller arm of the Seine above the bridge St. Michel, the reconstruction of the Archeveche, Double and Petit bridges, the displacement of the Orleans railway near the bridge St. Michel, the modification or suppression of the Monnaie dam and lock, the raising of the embankment walls 20 in. above the highest water level during the flood, and the adoption of suitable means for hermetically closing the openings into the Seine when a rise in the water level threatens.

The sewers discharging into the Seine are to be fitted with sluice gates, which may be opened or closed from above. An additional collector and siphon under the Seine to receive the waters from Javel and Grenelle is also proposed.

Besides widening the smaller arm of the Seine, it is proposed to deepen the bed of the river between Suresnes and Bougival, at a cost of $6,000,000, and to construct a canal from Annette, on the River Marne, to Epinay on the Seine, at an approximate cost of $35,000,000. This would pass much of the water of the Marne around Paris, thus relieving the Seine of it, until after the latter had passed through the city.

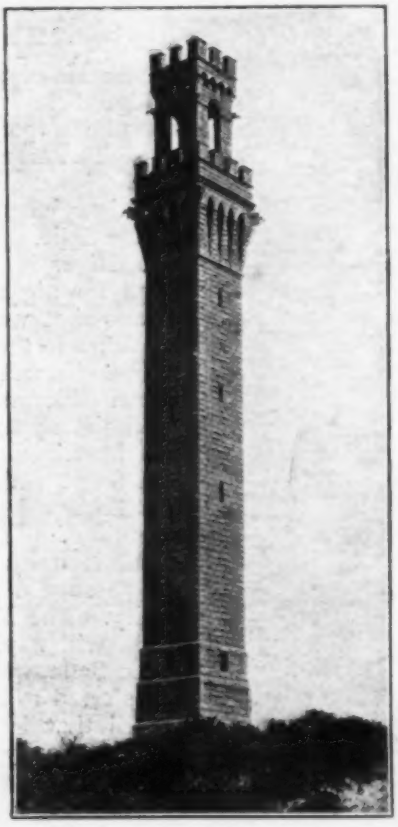
BLIND PERSONS TO USE WHISTLES

The danger to which the blind or partially blind are exposed in crossing the crowded thoroughfares of large cities, has caused an association for the benefit of those so afflicted to seek permission for the blind to use whistles.

Such a petition has been presented to the chief of the Chicago police department and granted, with the understanding that the tone of the whistles, not to be confused with the shrill blasts of those used by crossing policemen, should be soft and mellow. The crossing police have been instructed to pay special attention to the signals of the blind and to help them across the streets.

THE NEW PILGRIM MONUMENT

The new Pilgrim Monument on Cape Cod, which was dedicated by President Taft in August, is attracting international attention as an engineering marvel. Although the monument is 252 ft. in height and weighs 7,250 tons, ranking next to the Washington National Monument as the loftiest structure of solid masonry on this continent, it has been set upon a hill of sand and that, too, with what the uninitiated might regard as a conspicuously inadequate foundation. Yet for all its location on the sand dunes at one of the most exposed points on the Atlantic coast, it shows no vibration in the strongest gales that sweep over the extremity of Cape Cod, tests having been made when the velocity of the wind was in excess of 84 miles an hour.



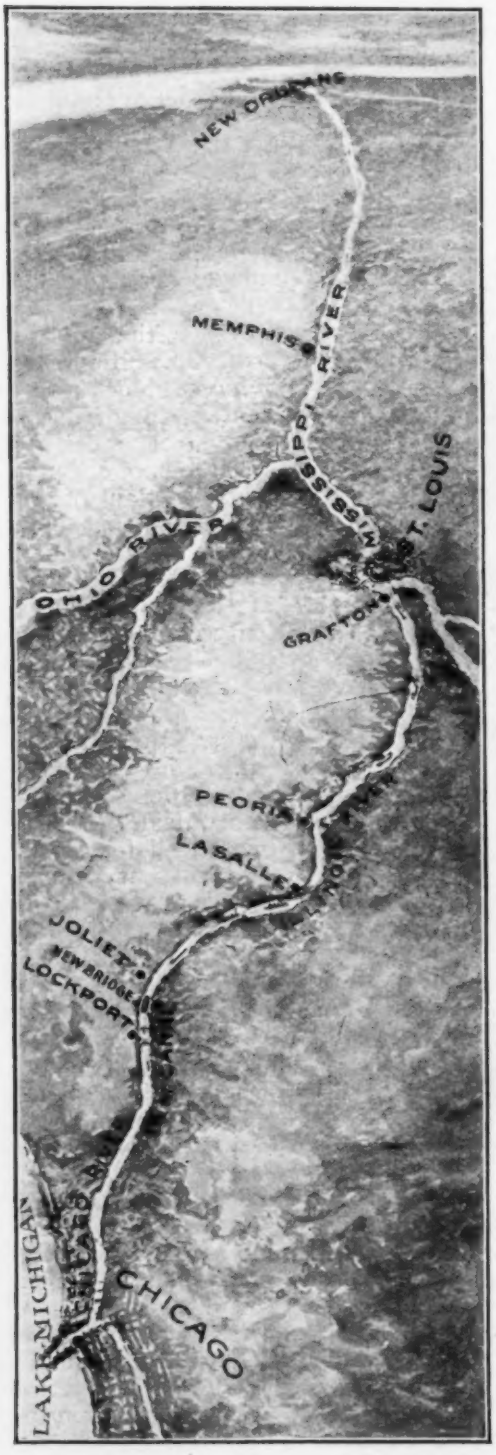
Ranks Next to the Washington Monument as Loftiest Structure of Solid Masonry

This great granite tower, which has cost upward of $100,000, has been under construction for nearly three years, President Roosevelt having laid the cornerstone, and the cost was defrayed by the national government, the state of Massachusetts, and private subscription. The government engineers gave much thought and study to the problem of anchoring such a monument on top of a hill of sand rising 90 ft. above mean low tide. It was finally decided to make no deep borings for concrete piers. Instead a square excavation was made to a depth of 10 ft. and on the level floor of pure, hard sand, a layer of wet concrete was placed to a depth of 3 ft. This constituted the first section of the monument foundation.

On top of this came a strata of reinforced concrete, embodying six different layers of steel rods, each rod an inch square. The rods crossed each other at right angles; at the corners rods were placed diagonally 5 in. apart; and each layer was keyed to the layer below. The ultimate reinforced block represented hundreds of the steel rods and 1,600 tons of concrete. This portion of the foundation is 50 ft. square at the bottom and 28 ft. square at the top, being pyramidal in form.

The masonry tower which rests upon this concrete foundation is 27 ft. square at the base, allowing a margin of 6 in. of foundation outside the base line on all four sides. The masonry structure is "anchored" to the foundation by means of steel rods and these steel rods, in comparatively short lengths but overlapping one another, extend to the top of the monument, having been embedded in concrete between the outer and inner surfaces of the masonry as the work progressed.

Upon the completion of the monument, the government engineers conducted tests and found that it had settled only one-quarter of an inch, and moreover the depression had been uniform at all points, so that the structure does not vary a hair's breadth from the perpendicular. The interior of the monument is 17 ft. square. Ascent is



The "Lakes to the Gulf"—Birdseye View from Chicago

accomplished through the instrumentality of combination inclined plane and step systems, constructed from reinforced concrete, and which enable sightseers to gain access to an observation platform under the arch at the top of the platform and 201 ft. above the base.

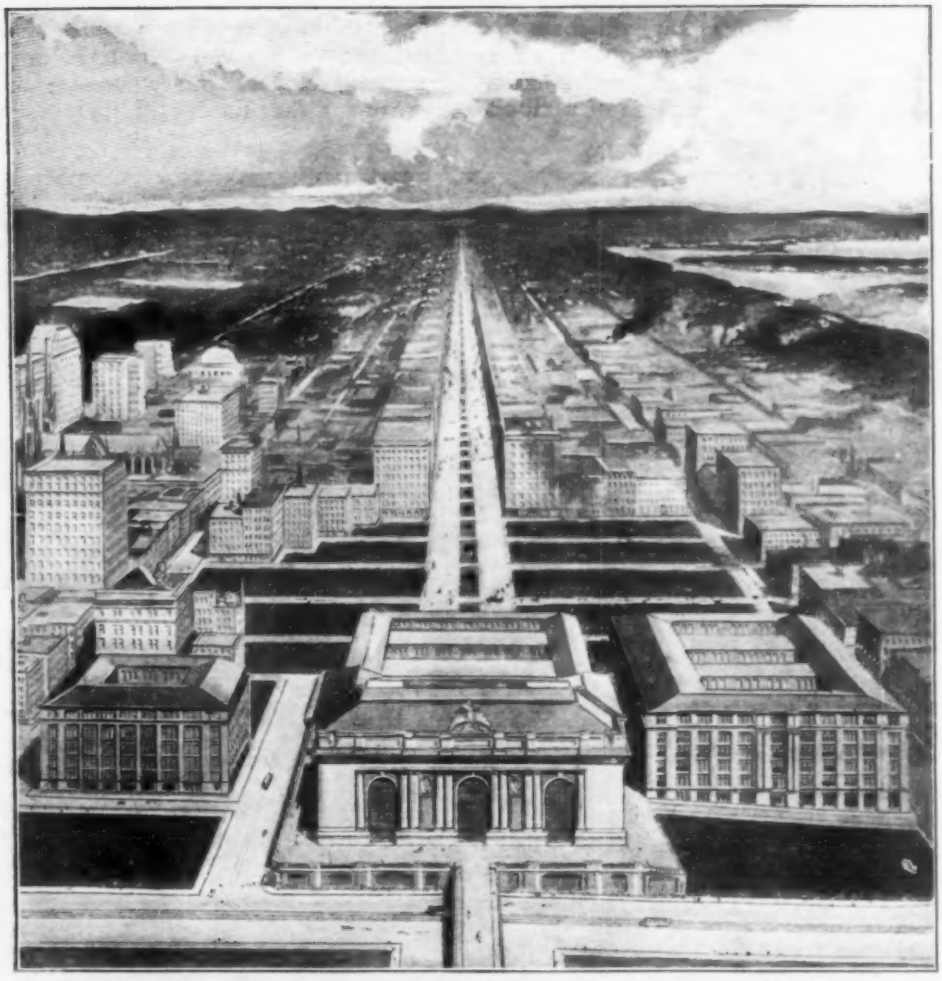
WATER TRANSPORTATION BETWEEN CHICAGO AND THE MISSISSIPPI

The blowing out of an obstructing bridge below Lockport, and the removal of a towpath bridge in Joliet, has opened a barge waterway from Chicago to the junction of the old Illinois and Michigan canal with the Illinois River at La Salle. Below La Salle the Illinois River is navigable to the Mississippi for big river steamboats, which means that water transportation from the lakes to the gulf is now a fact.

The obstacle to water commerce between Chicago and the river ports has been the upper stretch of the Illinois and Michigan canal, between Chicago and Joliet, which is now eliminated by the Chicago drainage canal. The lower stretch of the Illinois and Michigan canal is much better, and will allow the passage of barges of 200 tons' capacity. The Mississippi River steamboats will navigate the Illinois River to La Salle, where their freight will be transferred to barges for Chicago.

"All that is now needed to have a deep waterway from the Mississippi to Chicago," says Isham Randolph, consulting engineer of the Chicago sanitary district, "is the opening up of the Illinois and Desplaines Rivers and making them navigable between La Salle and Joliet. The Illinois and Michigan canal need not be used at all when this is accomplished, and the river steamboats may steam right into the heart of Chicago."

¶Spain proposes to build a continuous highway, 1,674 miles long, through that kingdom for the purpose of attracting motor tourists.



Birdseye View of Proposed Terminal—Vacant Blocks to the North to be Occupied by Monumental Buildings

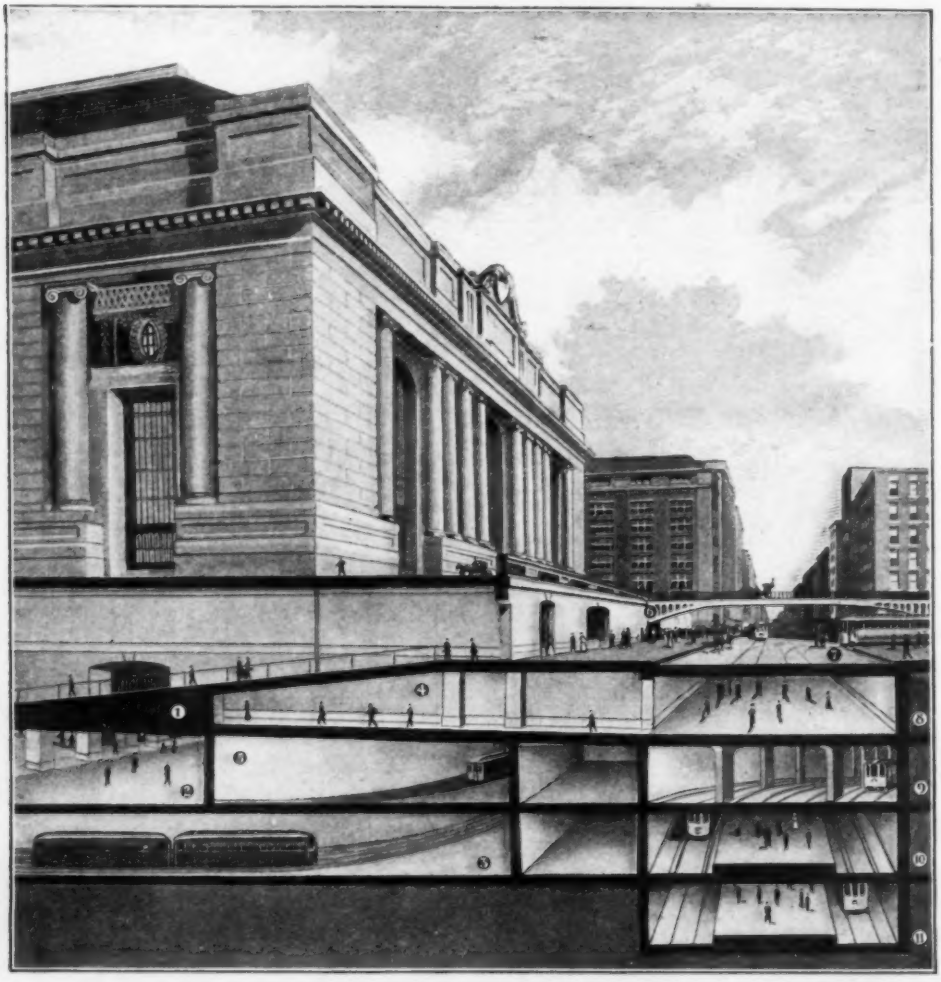
GREATEST RAILROAD TERMINAL IN WORLD

Railroad passenger terminals, like transatlantic liners, are growing to stupendous size. The great railroad station, heralded yesterday as the largest and most wonderful in the world, is dwarfed by the one of today, and this in its turn by the great terminal projected for tomorrow.

Just as the Pennsylvania system was ready to announce the completion of its $100,000,000 terminal, with its maze of tunnels and subways, the New York Central made known its plans for a terminal in the heart of New York, at an estimated cost of $180,000,000 and twice as large as any in existence. Instead of the tunnels of the Pennsylvania station, it will have a vast channel, two city blocks wide, and 10 blocks, or half a mile, in length, cut out of the solid rock. The work on this channel, carried on with the most perfect blasting and drilling apparatus, is just being completed after several years of incessant labor.

On each side of this man-made

chasm, and in some places directly over it, will be buildings that will form one of the most imposing groups of structures in the world. The buildings along Park Avenue will be of a monumental character, and the station building proper, spoken of as the "head house," will have a wide plaza in front of the main passenger entrance. Altogether the project will cover 20 city blocks, and over the 70 acres of tracks in the chasm, roofed level with the streets, will rise magnificent buildings. Some of these structures will be used for station purposes, others rented to manufacturers and wholesale merchants for the display of their wares, while still others will be reserved for fine arts exhibitions. In fact, without this provision for vast rental space the $180,000,000 investment would not have been justifiable.



Subways at New Grand Central Station—1, Incline to Through Train Concourse—2, Suburban Train Concourse—3, Suburban Train Loop—4, Passage to Through Train Concourse—5, Express Train Loop—6, Bridge over Street—7, Street Level—8, Joint Concourse for All Subways—9, Interborough Subway, West Side, Bronx, Brooklyn—10, McAdoo Tube to New Jersey—11, Belmont Tube to Long Island.

The waiting rooms and concourses for the passengers will occupy a total

of more than six and one-half acres, calculated to accommodate nearly 30,000 persons. The great concourse for the outbound passengers will hold 15,000 passengers comfortably, and the inbound concourse 8,000, while the waiting rooms proper will hold more than 5,000 more. The outbound capacity will be 70,000 passengers an hour, which is double the maximum carrying power of any passenger station in the world. Some 200 trains can be sent out every hour if necessary. Owing to the unique arrangement of the tracks, it is possible to keep practically one continuous train in motion. Instead of backing out after having discharged their passengers, as is ordinarily done, the trains will continue on around a loop.

Last year 21,000,000 passengers passed in and out of the Grand Central station, and the new terminal arrangement will accommodate more than five times as many, more, indeed, than the whole population of the United States.

The new terminal will have four levels, or three more than the old. The gallery on the grade of 42nd Street will be the top level. The next will hold the concourse and 42 tracks for through trains and will connect with the subway lines. On the third level will be 25 tracks for suburban trains, and under this a subway for inbound and outbound baggage.

The arrangements for the comfort of passengers show many innovations. One feature, for instance, is the little dressing-rooms, to be rented for a nominal sum, in which passengers may remove the marks of travel and change their clothes.

Another important and unique feature of the construction is the elimination of stairways. Wherever it is possible, gently sloping inclines take the place of steps. It is said that no railroad station in the world can be reached so quickly and in so many different ways for a 5-cent fare.

REMAINS OF A JAPANESE SENT HOME BY MAIL

The shipping, through the mails, of the remains of a deceased person seems extraordinary, yet the Postoffice Department was recently called upon for such service, and, finding nothing in the law to forbid it, complied.

The remains were those of a Japanese boy who had lived in Denver. His father, wishing him to rest in the fatherland, had the body cremated and the ashes tightly packed in a hermetically sealed jar. The postage required from Denver to Japan was only 22 cents.

A NEW DRINKING FOUNTAIN

While the managements of public institutions are making rapid progress in securing sanitary conditions, the average person is looking forward to having the same benefits in his own home. The ever-flowing drinking fountain in public school buildings makes a germ-proof method of obtaining water without the aid of a glass or tin cup. Practically the same sanitary drinking fountain has made its appearance in a device that may be attached to any water pipe connection for use in

For Home Use

homes as well as large and small school buildings. This simple fountain, as shown in the illustration, has a few points of superiority, one of which is the glass over-flowing cup. When the water is turned off for the night or at times when there is no use for it, the pipe and cup are completely drained through small holes provided for that purpose. The valve is set to make the overflow right on the water pressure.

Remarkable Photograph Taken During the Royal Yacht Club Races in August—The Deck of the "Cicely" (Schooner) Under Water

AMERICAN YACHT WINS IN ENGLISH RACES

An American-built yacht, the "Westward," won the Royal Yacht Club prize from Sir Thomas Lipton's "Shamrock," at Cowes, on August 1st. The racing over the famous English course this year was attended by more than ordinary difficulties and called forth the utmost skill on the part of the yacht commanders. Choppy seas and stiff gales caused more or less discomfort and lent an element of danger to the sport that made the contests all the more exciting. The race the American boat won was sailed in a heavy breeze. The Kaiser's American-built yacht "Meteor" finished fourth in this race, with the "Germania" third.

The "Westward" is owned by Mr. Alexander Cochrane and this is her first season.

"Cowes Week" was made notable this year by the presence of King Alfonso, who took advantage of his visit with Queen Ena to her English relatives to look over the yachts of the Royal squadron. Alfonso is a keen sportsman himself and is an expert skipper. He spends much time on his racing yachts while at San Sebastian. While he was a guest on Sir Thomas Lipton's yacht, the "Shamrock," she was almost wrecked by the falling of her topmast. The topmast was 50 ft. long and fell to the deck.

The racing was also given a place out of the ordinary by the sailing of the first race for the King's Cup, presented by King George V. The cup was won by Lord Dunraven's yacht, "Cariad II," a 150-ft. ketch.

The "Westward," Which Won from Sir Thomas Lipton's "Shamrock" at the Cowes Races

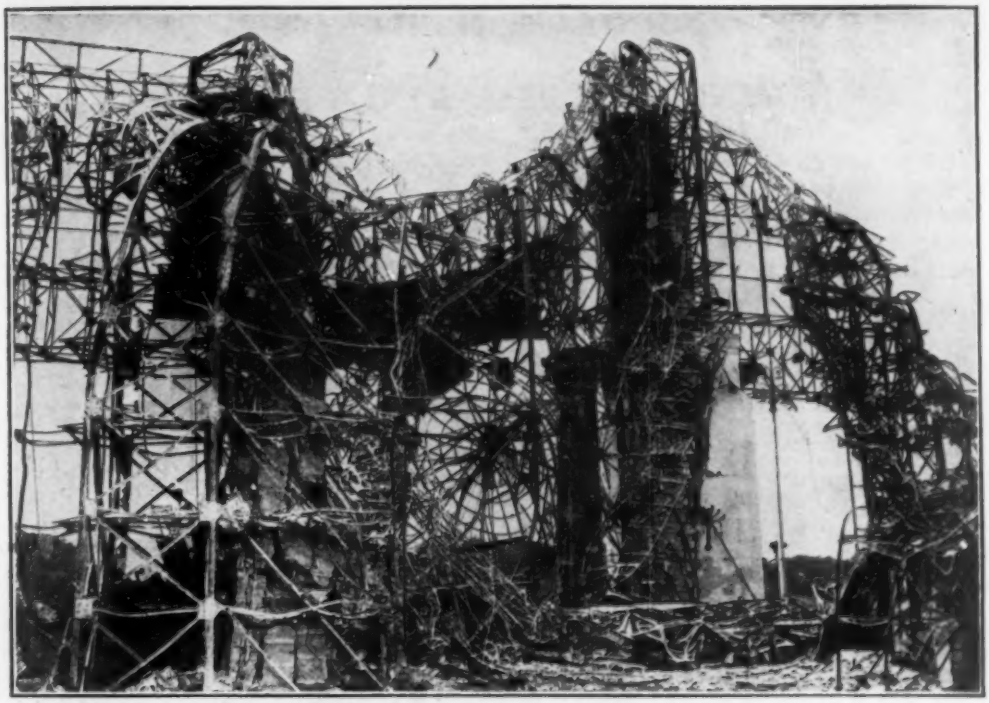
CORNEA GRAFTED ON EYE RESTORES SIGHT

The grafting of a healthy cornea to the eye of a person who had been blind two years, as a means of restoring sight, was successfully accomplished at the Medico-Chirurgical hospital in Philadelphia last month. A woman whose eye was so badly diseased that she had become blind was the subject of the operation. A workman in the Baldwin Locomotive Works was struck with a minute steel filing which penetrated the cornea and the muscles of the eyeball, completely destroying the usefulness of the latter. The woman was an inmate of the hospital and as an experiment the surgeons took the healthy cornea from the injured man's eye and grafted it on the eyeball of the woman. When the wounds healed, the eye was found to be in almost as good condition as though nothing had happened to it and the woman could see.

¶ The first man of record to become insane on the subject of aviation has appeared in New York. He imagines himself the brother of the Emperor of China and thinks he has perfected the art of flying.

A REMARKABLE PHOTOGRAPH OF THE FIRE AT THE BELGIAN EXPOSITION

At the Extreme Left: the Restaurant "Chien Vert" (Green Dog). Next the Triumphal Arch Surmounted by a Statue of St. Michael at the Entrance to the Exposition. In the center the Blazing Ruins of the Administration Buildings Are Seen, and at the Right, the Tangled Iron Framework of the Central Palace of the Belgian Section.



Scene in the Belgian Section After the Fire

Showing the Complete Devastation in the Burned District

MASSES of twisted steel and crumbled plaster were all that was left of many of the handsome buildings at the international exposition at Brussels, Belgium, after it had been swept by fire on August 14. The buildings as a whole were composed of a light steel framework clothed, as is customary with temporary exhibition buildings, with lath and plaster. Such buildings burn like tinder. Varying estimates on the damage place it between twenty and fifty million dollars, but on account of the destruction of many priceless art treasures, the loss cannot be entirely figured in money.

MINING IN THE PHILIPPINES

There are at the present time in the Philippines two gold districts producing results, while much exploration is being carried on in five other localities. In Benguet there are three mills in operation, with prospects of three others in the near future. Three dredges are working night and day and yielding substantial returns in Ambos Camarines, and mills are about to be erected on the San Mauricio and Tumbaga.

Hand-Boring Tests for Gold

Other ore prospects now being developed in the islands include copper, lead and iron, while coal and oil promise well for the future. Development work is steadily progressing on the copper deposits of Mancayan-Suyoc, and prospecting is being carried on in six other localities. Promising lead prospects have been explored on the island of Marinduque, and lead is also known to exist in Cebu. Iron deposits were known long before the American occupation, in Ambos Camarines and in Marinduque.

A chrome iron ore has recently been discovered in the province of Surigao, and there is one small native iron furnace at Angad, operated by Maria Fernandez, a Filipino woman, the only woman of the islands who is a mine operator. This is the only iron furnace in existence in the Philippines, and its product is almost wholly used in the making of plow shares for the natives of the neighboring provinces.

There are at present two coal mines in active operation, both situated on the little island of Batan, on the east coast of Luzon. One of these mines is operated by the United States government; the other is a private concern, supplying coal to from 20 to 25 inter-island steamships. Coal has been found on several islands in the archipelago and at least two oil fields exist.

Only Iron Furnace in the Philippines—Operated by a Woman

FINDING PEARLS WITH X-RAYS

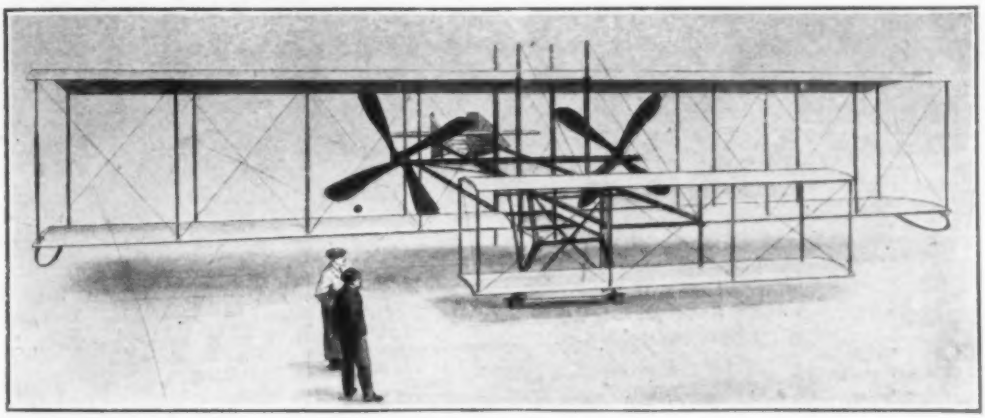
Through the utilization of the X-ray, the necessity of opening every oyster in the gathering of pearls has ceased to exist at a pearl fishery in the Ceylon Islands. The oysters are arranged in batches

of a hundred on a moving platform or carrier, and are passed in succession under the rays and above a special paper devised for direct radiography. Unless the subsequent development of the prepared paper betrays the presence of a pearl, the oyster is not opened. If the pearls discovered are small, the oysters containing them are replaced in their natural home, and are from time to time re-examined until the pearls are large enough for commercial purposes.

AN AEROPLANE BUILT TO CARRY EIGHT PASSENGERS

The largest aeroplane ever built has just been produced in private shops near Paris for the De Dion-Bouton Company, the automobile manufacturers. The aeroplane is of the biplane type with a wing spread of 65 ft., and measures 47 ft. 5 in. from front to rear extremity. The two main, superposed planes are 8 ft. 2 in. from front to rear edge, and are the same distance apart. In front is a biplane elevation rudder of such dimensions that it alone could be used as a man-carrying glider. Its length is 14 ft. 9 in., and its depth 3 ft. 3 in. It is estimated that the machine will weigh 749 lb., without motor or mechanical fittings.

Lateral stability is secured by the use of ailerons, carried midway between the two planes and projecting beyond them, as on the Curtiss machines. At the rear are two horizontal planes with variable angle of incidence, and two vertical planes, the extremities of which form lateral rudders. Hollowed American spruce, wrapped with varnished canvas, has been used exclusively for the framework. The wood is split lengthwise, hollowed out, and the two halves joined together by a special process of gluing that makes them impervious to moisture, and unaffected by heat.



The Eight-Passenger Aeroplane

The motor will be mounted on the main framework at the level of the lower plane, and just in advance of the entering edge.

Two propellers are employed. Each has four blades. They will be driven through reducing gears, giving them a speed of 400 revolutions a minute.

THE GUIDING LIGHTS OF THE OCEANS

The number of lighthouses and lightships in the world, not including the inland bodies of water, such as the Great Lakes, is 15,224. Of this number, 12,171 are on the Atlantic; 2,288 on the Pacific; 677 on the Indian Ocean, and 88, in the Polar seas.

Rangers Going to the Head of a Prairie Fire with Fire Wagon

Bull River Ranger Station

Forest Guards on Fire Patrol Duty

Forest Ranger Putting out Ground Fire With Wet Blankets

DEVASTATION OF FORESTS BY FIRE

Every year has brought its disastrous forest fires, resulting in timber loss mounting into the millions, destruction of property, and deaths. But the record this year, due to a great extent, say advocates of conservation, to the fact that Congress refused the required funds for even as much forest patrol as has previously been possible, is far more overwhelming than ever before.

Three states, Washington, Montana, and Idaho, suffered severely, great stretches of forests, including national reserves, being wiped out in each. Many communities were abandoned before the onward sweep of the flames, and many lives were lost, mostly among the forces called out to fight the fires.

According to a bulletin just issued by the Forest Service, forests fires are of three classes, surface fires, which burn the surface layer of dry leaves, grass, brush, and small trees; ground fires, which occur where the mineral soil is covered with a deep accumulation of vegetable mold; and crown fires, which burn through the crowns of the trees.

Nearly all forest fires start as surface fires, the dry litter on the ground being ignited by a spark from an engine or camp fire, or, as was charged during the recent fires, may be ignited intentionally. At first the fire burns in a small circle, gradually spreading out in all directions. If there is a wind, the fire burns with greater intensity on the leeward side, and quickly assumes an oval form. At first the front of the fire is very narrow, but gradually widens and takes the form of a broad, irregular line. The front may reach indefinite proportions, from a few hundred feet to several miles in width. Ordinarily a surface fire simply burns along the ground and does not go into the tops of the trees. Sometimes the flames reach up into the crowns and scorch them, even igniting them here and there, but such a fire is classified as a surface fire, unless it actually burns through the crowns.

The term "ground fire" is applied to the slow fires that burn in the deep accumulations of vegetable matter common in many of the damp northern forests. The fallen leaves, needles, and other offcastings of the trees decompose very slowly, and this material absorbs much moisture and retains it tenaciously. Consequently, it is very seldom ignited, but in some seasons becomes thoroughly dry and will burn. When it does ignite it burns very slowly, but with intense heat, and is very difficult to extinguish. Such fires in the Adirondacks have been known to burn all winter, creeping along under deep layers of snow.

Crown fires almost invariably start from surface fires, and occur when the woods are very dry and when there is a high wind. Without a strong wind, a crown fire is seldom started, but if the wind is sufficiently high, will spread with great rapidity, taking at once a V-shaped front with a distinct head. This front may be only from 50 to 100 ft. wide, or, in the case of large fires, may be very great, consisting of a series of heads. Close behind the fire in the crowns of the trees comes a surface fire, burning with the same rapidity. The strong draft of heated air arising from the fire carries up with it an immense quantity of burning cinders and pieces of bark. The wind carries this material far in advance of the main fire head, and thus innumerable new surface fires are started, which fact gives rise to the popular idea of a spontaneous starting of fires in advance of a crown fire.

HAND-PAINTED HATS LATEST MILLINERY FAD

Efforts have been made to interest the Audubon Societies throughout the United States in the newest phase of the crusade against the use of birds' plumage in millinery; the London style of hand-painted hats. These hats are being sold in large quantities not only to women who are opposed to the de-

struction of birds in order to get their plumes, but to many people who are inspired simply with the desire of obtaining a pretty hat. The prices charged

Hand-Painted Hat with Floral Design

for them vary with the artistic merit of the painting and the quantity of it displayed on the hat.

While most of the headgear of this type seen on the Strand or in Regent street is of light color, the scheme has been adapted to darker shades as well. It consists of painting in natural colors wreaths of flowers around the crown and on the brim of felt hats. The colors are so applied that the hats can be cleaned without damage. The buyer can secure any design that suits her taste and fancy, as most of the hats are made to order with color schemes to match the wearer's dress and meet the requirements of her complexion.

¶Old-fashioned merry-go-rounds, imported to China as an adjunct to a circus 10 years ago, never met with favor and were recently sold for junk at auction in Shanghai.

MECHANICAL CUT-OFF FOR PARLIAMENTARY BORES

First aid for bored statesmen is promised by a Japanese inventor, if the parliaments of the world will adopt the ingenious and perfectly simple device he has constructed for cutting off orators, filibusters and the like whenever the patience of the majority is taxed to the limit. According to a description given in Engineering and Contracting, the orator is made to stand on a specially prepared section of the floor which is hinged in the manner of the trapdoor on the stage. Each member's desk in the hall is connected with the lock of the trap by a tube and each member is provided with a ball made of lead or other metal that is small enough to enter the tube. When a member does not like the sentiments or style of the orator, he simply drops a ball into the tube at his side. When a number of these balls, sufficient to represent a majority of the members, is dropped into the tubes, their combined weight springs the catch on the trap and the orator is quickly dropped to the floor below.

THE FRENCH SUBMERSIBLE ACCIDENT

The overhauling of the French submersible "Pluviose," sunk by a collision with a passenger vessel in the English channel, has led to the belief that the little vessel was disabled by internal trouble before the collision occurred. Before, or at the moment of the collision, short circuits broke out all over the vessel, especially in the central post, where all the cables were found fused, the woodwork of the switchboard charred, and the ebonite twisted or broken. If the fire broke out before the collision, it could have been responsible for rendering the crew powerless to prevent the crash.

¶A broad highway, 60 miles long, suitable for motor vehicles, is contemplated to connect Toledo with Detroit.

EVENTS OF THE MONTH IN AERONAUTICS

The ambition of aviators in both Europe and America seems now to be set upon high flight. The mark set by Brookins in July was quickly surpassed by J. Armstrong Drexel, at Lanark, Eng., when he established a new world's record, 6,750 ft., on August 12. Drexel was only permitted to wear his honors a short time. On August 29, Leon Morane ascended 6,889 ft. at Havre. Glenn Curtiss announced he would go after the altitude records on the occasion of his flight from Euclid Beach, Cleveland, Ohio, to Cedar Point, near Sandusky, and return on August 31 and September 1. Owing to the stiff breeze blowing at the time he did not carry out this part of his program, although he established a record for distance flight over water, having made 120 miles over Lake Erie, 60 miles from Cleveland to Cedar Point, which he accomplished August 31, and 60 miles on the return, September 1.

Aside from the altitude records the most interesting event in aviation during the month of August was the spectacular attempt of John B. Moissant, an American, to fly from Paris to London with a passenger. Starting from Paris on August 17, he safely negotiated the better portion of his flight, but through a series of unfortunate accidents missed the goal for which he was striving, 27 miles short of the English metropolis. He carried his mechanician, who weighed 182 lb., as a passenger.

Military aeronautics have occupied the attention of all nations and many distinct advances have been noted. Maj. Samuel Reber and Lieut. Clarence C. Culver of the U. S. Signal Corps, completed a series of successful wireless experiments at Mineola, Long Island, on August 25, with the assistance of J. C. Mars, J. A. D. McCurdy and H. M. Horton, the latter being the inventor of a method of adapting the wireless apparatus for aeroplanes. No difficulty was experienced by the army officers in receiving and sending messages. Experiments with the new type of field guns, invented for the German army, against dirigibles were highly successful from the point of view of the gunners, the balloons being shattered during the course of the tests which were held at Ruegenwalde, Prussia, August 11. Grahame White, the English expert, made a flight around the assembled English fleet at Tor Bay early in August, dropping theoretical bombs from an elevation of 1,000 ft. The Japanese war office has closed a contract with the German representatives of the Wrights to supply the Mikado's army with a fleet of aeroplanes, and officers

J. ARMSTRONG DREXEL,
American Aviator Who Has Made Some Remarkable Flights in England

are to be sent to Germany to learn to fly.

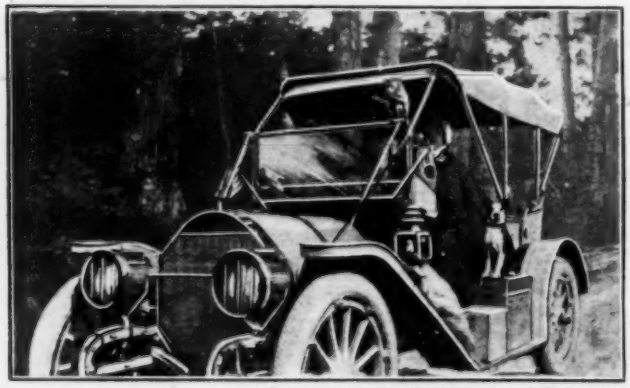
A company was formed during the month for the purpose of carrying on a regular insurance business against losses through aviation, as well as life and accident insurance for aviators, and in Arizona a mine owner closed a contract for transportation of freight to his mines by monoplane.

Walter Wellman finished preparations for his flight across the Atlantic ocean by dirigible at Atlantic City, August 29, and announced he would start within two weeks. The balloon is 220 ft. long and has two engines of 80 hp. each.

LeBlanc covered himself with glory at Paris on August 17 by winning the Le Matin prize of $20,000 in the distance cross-country flight of 489 miles, which he covered in 11 hr. 56 min. of actual flight.

One remarkable feature of aviation during the month of August is the small number of fatal accidents as compared to the month previous, when eight were killed. Van Maasdyk, a Dutch aviator, lost his life when the motor of his machine stopped while in flight at Arnheim, Netherlands, on August 27. Another Dutch aviator, De Baeder, fell 100 ft. at Cambrai, France, and was killed. In America, Benny Prinz, an aeronaut and parachute jumper, fell a distance of 2,500 ft. at Asbury Park on August 12, during the course of an exhibition.

Charles F. Willard marked a distinct advance in flight by carrying four passengers in his biplane at Hempstead August 14. The machine rose in the air and was maintained on an even keel 20 ft. from the ground for a distance of 1,200 yd.



(From a Photograph made in Japan.)

Mrs. Harriet Clark Fisher, and Her Globe-Circling Auto

AN AMERICAN WOMAN MOTORS AROUND THE WORLD

Mrs. Harriet Clark Fisher of Trenton, N. J., who already enjoyed the distinction of being one of the few women engaged in the manufacture of steel products in this country, completed a globe circling tour in an automobile August 16, when she returned to her Trenton home after an absence of exactly 364½ days. With a party of three others and a ton of luggage, Mrs. Fisher left Trenton, August 17, 1909, for New York. The machine was placed aboard a steamer and conveyed to Europe.

After touring Europe the party passed into Asia, and went through India, China, Japan, crossed the Pacific by steamer, and traversed the United States in the automobile. A distance of 20,000 miles was covered in the car and something like 15,000 miles by boat.

Mrs. Fisher was received hospitably in all the countries she visited and in the Orient was treated with distinction. Part of the time while on the road, the entire party slept in the open, regular camp equipment being carried for this purpose. In India and Japan Mrs. Fisher was given elaborate entertainments.

¶An ink that has carbolic acid as one of its principal ingredients is now being used by the officials of the National Bank of Spokane, Washington, in signing national bank notes, thus making the first real antiseptic money issued in the United States.

New Rifle Being Tested at Camp Perry

NEW RIFLE DISCHARGES 500 BULLETS PER MINUTE

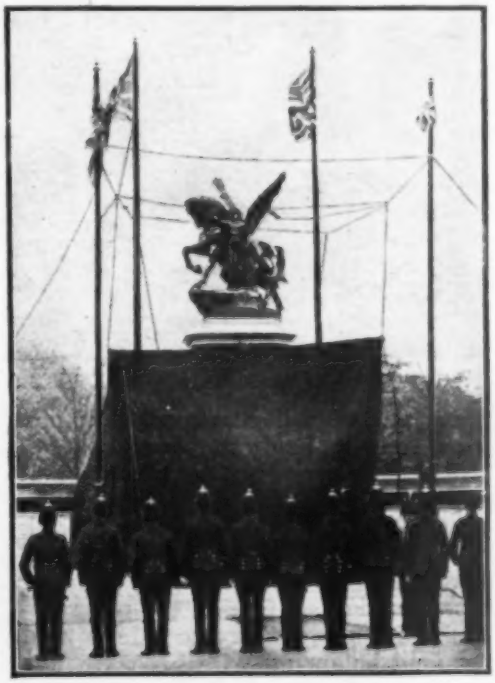
Riflemen assembled at Camp Perry, Ohio, for the target competitions under the auspices of the federal government, the state of Ohio and the National Rifle Association last month, watched with interest the exhibitions of the recently invented Benet-Mercier gun, which combines the rapidity of fire, range and effectiveness of a machine gun with the lightness and ease of action of a magazine rifle. The gun is fired from a rest and is held against the shoulder of its operator, who can either fire from a sitting position or lying prone. The regulation cartridge is used in clips that hold fifty. A good rifleman can discharge from 300 to 500 shots per minute, if assisted in feeding by a man to fill the clips. The gun is at present undergoing a series of tests by army officers with a view to its adoption by the government.

UNVEILING A STATUE BY ELECTRICITY

As it was impossible for the Duke of Connaught, uncle of England's king, to be in two places at once during the ceremony of unveiling the monument just erected in memory of the officers and men of the Royal Artillery who fell in the South African war, electricity had to be used as his assistant.

Standing in St. Paul's Cathedral, where he was attending the service, he pushed the button of a specially constructed electrical apparatus which caused the covering to be drawn away from the memorial, about two miles distant.

The statuary of the memorial represents war as a charger, controlled by a winged figure of peace.



Unveiling at a Distance by Electricity

BICYCLIST PERFORMS FEATS AT AVIATION MEET

That the aeroplane is not always enough to rivet the attention of the crowd is shown by the efforts of the

A Difficult Trick

managers of the Blackpool Aviation Meet in England to provide other means of entertaining the throngs that gathered to witness the daring of the airmen. Strathmore, the Dutch trick cyclist and equilibrist, was imported from Amsterdam to fill out the program between flights. One of the most difficult of his tricks was to ride around the field balancing with his teeth five chairs, piled one on the other.

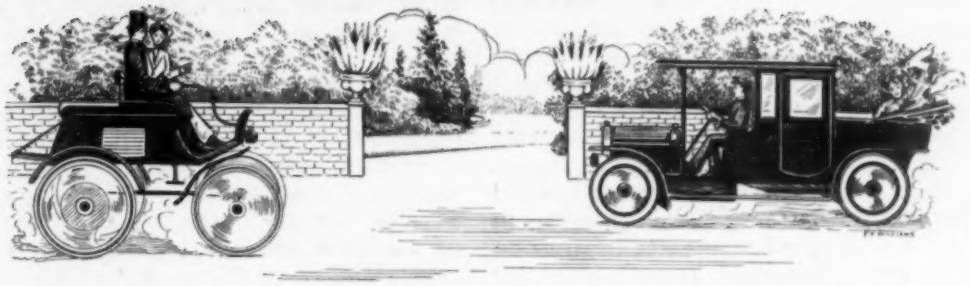
AUTO TRIP FROM COAST TO COAST IN TEN DAYS

In the motor car records of the United States, August 18, 1910, will be written as one of the red letter days of automobile history, L. L. Whitman having "checked in" at the foot of Market street, San Francisco, on that day completing a journey from New York in a four-cylinder, 30-hp. car in 10 days, 15 hr. and 13 min.—4 days, 10 hr. and 59 min. faster than the best time previously made from coast to coast. The distance covered measured 3,557 miles and the travel was continuous, night and day, from 12.01 A. M. August 8, when the start was made in New York, until San Francisco was reached. Mr. Whitman alternated at the wheel with E. I. Hammond. The only stops made were to take on fuel and make necessary repairs.

The route laid out for the trip took the car through Albany, Utica, Buffalo, Cleveland, South Bend, Cedar Rapids, Council Bluffs, North Platte, Cheyenne, Ogden and Sacramento. Fast time was made from New York to South Bend; heavy rains and muddy roads seriously interfered with progress between South Bend and Cedar Rapids. Tall grass, deep sands and the most primitive of roads were encountered from the Wyoming line to Reno.

CHESS ON SHIPBOARD BY WIRELESS

A game of chess, remarkable because of the distance which separated the participants and the means by which they kept in touch with each other, was recently played many miles out at sea. The opponents were Dr. Carment, aboard the "Morea," and a Mr. Miesters, aboard the Dutch steamship "Rembrandt." The game started while the ships, both bound for Colombo, Ceylon, were 150 miles apart, and continued 24 hours. Dr. Carment won the game on the 69th move. The moves of the players, who were strangers, were flashed from ship to ship by wireless.



WHAT BECOMES OF THE OLD AUTOMOBILES?

By ROY O. RANDALL

Autos, autos, everywhere,
And not a car that's old.

THIS metrical sentiment, slightly paraphrasing Coleridge, defines the daily impression of the casual observer, who, watching the boulevard's brilliant procession of whirring wheels, flashing brass and brightly enameled colors, in wonderment asks himself, "Where are the cars of yesteryear?"

What has become of the strange examples of motor car building which marked the beginning of the industry in America? Where are the high-wheeled monstrosities around which the gaping crowds thronged in the years shortly following the Chicago World's Fair? Whither have drifted the Panhards and other foreign red and blue "devils," so potent during that earlier period in arousing admiration and envy?

And the later models of American construction, say, of five, ten or a dozen years back. They appear to have vanished like the dinosaurus and the dodo.

If you would solve this mystery, which is far from lacking in human interest, go to the men who are selling the splendid and mighty cars of today, then to the second-hand dealers and, finally, to the junk man who will give you the last chapter of the tale.

From them you may hear the story in varying versions. Said the representative of one big automobile manufacturing company:

"The query, 'What becomes of the old automobiles?' reminds me of that other oft-repeated question, 'What is the life of a machine?' Into both there enter so many contingencies that I hesitate to answer. The history of an automobile, that is, a good one, from the time it leaves the factory until the scrap iron collector gets possession of it, is full of interest. Its first owner, ordinarily, is a man of wealth who runs the car one season, after which he becomes enamored of some new device on a later model of the same make, a new body design or some other feature, or switches over to an entirely different make of car and turns the old one in on his new purchase.

"Probably the car is in first-class shape and only slight repairs are required for putting it in excellent running condition. But it is second-hand. Notwithstanding that fact, a buyer usually is found who pays for it two-thirds of the original selling price. This second owner, not being of the flush money type, may operate the car until it approaches a degree of general decrepitude.

"He will then dispose of it, either to a second-hand dealer or to one of that class of buyers which has the 'auto bug.' This man is bound to have a machine and if it will run at the out-

set, he is satisfied—he is the owner of an automobile. After the third owner's modest salary fails to keep up with the steady outgo for repairs, the machine then falls into the hands of another 'bug,' who has the disease in the tertiary stage. After numerous doleful experiences and much 'doctoring' of the old wreck, the latter inevitably ending in failure, the junk man carts it away on his truck and finds a ready market for the brass lamps and trimmings, the rubber of the tires and the iron.

"There is another and less scrupulous sort of person who gets hold of an old, dilapidated car and, because it still is classified as an automobile, is able to take out insurance on it. A mysterious fire or explosion puts the car entirely out of business and, if the insurance adjuster is 'easy,' the owner of the car may make a profit on the nefarious deal."

One dealer was of the opinion that the average man on the street was deceived if he imagined that all cars he saw on the boulevards and elsewhere were new cars. "Don't fool yourself," he said. "There are hundreds, I almost said thousands, of cars running about that are old enough to be turned out to pasture. Why, an engine developing only one horsepower could move a small car over level boulevards. Many an old, broken-down car, glossed over with some nice enamel and with the brass parts polished up, is perambulating around. It's true that lots of the old machines go to the western towns and to the farmers, but not all of them by any means.

"Look, there goes one now." The dealer pointed to a car of the touring type. "That car probably is of the 1903 crop. And there are others still older. I can pick them out by the dozen. Farmers do get stung on second-hand cars that have been furbished up a bit, but so do the unsophisticated of the city. One class is no more ignorant than the other.

"These 'prospects' come to the dealer with very little knowledge and this applying only to two or three makes of cars. After they've been turned loose in dozens of shops they become bewildered. They have come here, though, to buy an automobile and

Its Last Resting Place—The Junk Pile

after they arrive at complete confusion they settle on the first thing that looks good to them at the price they are able to pay. Naturally they get stung right. They see a machine nicely varnished up, with its brass parts shining, tires in good shape and after a trip in the derelict, during which the car is piloted by an expert who gets all available power out of the engine, they fall for the game and sign a check. The tyro frequently is deceived, and intentionally, by conscienceless dealers with regard to the speed obtainable from an old car. In many cases the maximum speed possible with a wornout engine is from 12 to 15 miles an hour, maybe not more than ten.

"The demonstrator handles the car as only an adept of many years' experience can, and, arriving at the maximum of ten miles, he turns to his quarry and inquires: 'How does this strike you? She's running twenty miles now, maybe a trifle more than that. Believe you said you didn't want too fast a car.'

"'No-o-,' is the uncertain response, 'but you could let her out if necessary?' 'O yes,' the driver answers, 'certainly—up to 30 or 35. But we don't dare to take chances here on the avenue. The cops watch us all the time for speeding. They're on the job every minute. Got soaked 15 and costs last week.' This veracious statement satisfies the credulous buyer and he finds at the end of the ride that he has bought something. That's exactly what it is—some *thing*."

"The old cars? Why, there is no such thing as an old car," exclaimed one of the largest second-hand dealers in the country. "That is," he amended, "in some makes. Let me show you." He led the way to the rear of his spacious salesroom and pointed to a two-passenger car with top extending far forward which somehow was remindful of the Avenue de l'Opera or the Champs Elysee.

"French car? Yes, you're a good guesser. It's a Panhard of 1892—eighteen years old, originally built for four passengers. As you can see the car looks right, even at this late day, and it is, without exaggeration, still a serviceable car. The body has been remodeled and now seats are provided only for two. The owner holds this car at $500. Probably you'd be interested yourself? No?"

There are, indeed, many interesting features in the second-hand business and there are, if the truth be told, some handlers of cars who are not over scrupulous in their dealings with the more ignorant class of buyers. All they desire is to make a sale and the buyer who looks no deeper than the clean and shining exterior of a patched up machine always gets the worst of it. Would he buy real estate that way? Most assuredly no. Yet he will spend a thousand dollars or more on an antedated automobile with sublime recklessness.

The tricks in this new trade are legion. For instance, a salesman will tell the prospective buyer that a certain car is owned by a man or woman who has just obtained a divorce. A big price will be asked, but the salesman will say that the owner needs money and might take less. In some cases they operate with a confederate, who comes into the building while the customer is there and poses as the owner. Another scheme is to call up the imaginary owner on the telephone and, through a confederate working at the other end, probably stationed at a neighboring drug store, permit the 'prospect' to talk with this man who will tell a hard luck story and, reducing the price, will force a sale without proper demonstration of the car.

In every case the machine sold is the concern's own property and is in bad condition. Customers also are told that the machine they are interested in is owned by a broker or Board of Trade man who has suffered severe losses in recent speculation and must sacrifice a practically new car, in perfect condition, in order to raise money at once. These schemes are only a few of the many that are worked in the disposal of old automobiles.

Unlike man, whom a great poet gave

seven ages, the automobile has not more than four or five periods of transition from its place of origin to the "boneyard." Its tenure of life is brief but brilliant, like that of the butterfly.

Milady, speeding home from the matinee with a gay party of friends in her luxurious car, little dreams of that not distant day when a keen-eyed, weather-beaten junk man will be breaking up its frame for the few remnants of value which it may still possess. The gentle owner of the marvelous, fleeting vehicle is only conscious of its present magnificence and thrills at the thought of how far it surpasses the automobile of Mrs. Jones.

She sinks back luxuriously in the cushions and the machine, almost a sentient thing, rushes swiftly to its ultimate doom—sans body, sans wheels, sans tires, sans everything.

DISINFECTING SEATTLE WITH SALT WATER

Wholesale disinfection of the streets of Seattle by means of sea water is now being carried on by order of Commissioner of Health, Dr. J. E. Crichton. A number of cases of infantile paralysis have been found in the city, and after several deaths a strict quarantine of all cases was ordered. The state has co-operated in the work.

Seattle for the past six weeks has experienced an unusually dry spell, and physicians attribute the spread of infantile paralysis to dust. Alarmed at the spread of the disease, Dr. Crichton instructed the superintendent of streets to use sea water from Puget Sound, in laying the dust and flushing the streets.

"Salt water is the best germicide in the world," says Dr. Crichton. "The sea water contains seven grains of chloride of sodium to the gallon. Within a few days the city streets will become white with sodium chloride and the action of the sun's rays on this will produce chlorine gas, the best disinfectant known to science."

"SWEATING" GOLD COINS

Recent investigations of the secret service men in New York drew attention to a very interesting as well as very ancient method of procuring gold from coins without greatly defacing them.

The method is called "sweating," and consists of placing the gold coins in a burlap bag and shaking vigorously for an hour or so. The tiny pieces of gold thus knocked off the surface and edges cling to the bag. The coins are then removed and passed into circulation again, apparently no more worn or battered than most of the metal money a few years old. The burlap bag is burned, and the gold dust which remains is gathered up and melted.

The treasury at Washington has been getting back large quantities of gold coins, many of them not long out of the mint, which are short in weight from 5 to 15 per cent. The greater number of the maltreated coins are of the $20 denomination, and some of them lacked $2 or $3 in actual value of gold. When placed under the microscope by experts, it became evident that the coins had been handled with violence, and the large number aroused suspicion.

JENATZY BREAKS OLDFIELD'S SPEED RECORD

The record of having traveled the fastest of any human being is now held by Camille Jenatzy, the Belgian who recently broke Oldfield's record at Ostend, Belgium. He did the flying kilometer (3,280 ft.) in 16 4-5 seconds, which is at the rate of 133.1 miles an hour. Oldfield's record-breaking run, made at Daytona, Florida, last March, was at the rate of 131.28 miles an hour.

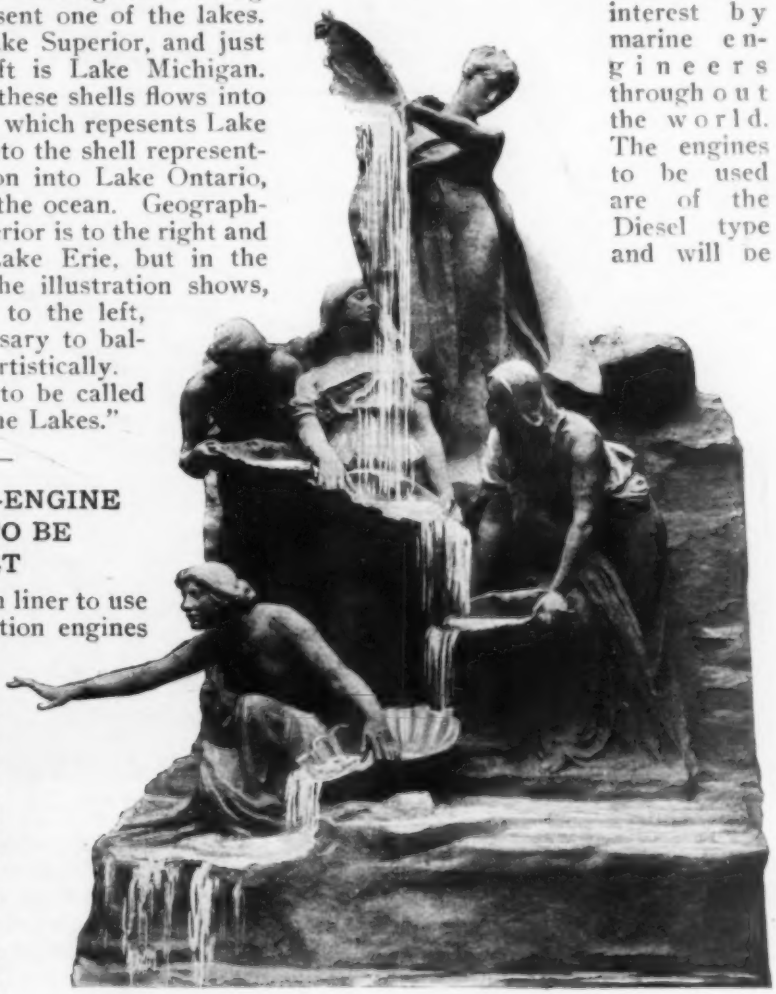
Jenatzy, however, is not to be granted the official record because he made only one trial, whereas the rules call for two.

"THE SPIRIT OF THE LAKES"

Lorado Taft's beautifully sculptured group, symbolical of the Great Lakes, is being cast in bronze and will soon be erected just south of the Art Institute on Chicago's lake front.

The shells and the figures holding them each represent one of the lakes. At the top is Lake Superior, and just below to the left is Lake Michigan. The water from these shells flows into the central shell, which repesents Lake Huron, thence into the shell representing Lake Erie, on into Lake Ontario, and thence into the ocean. Geographically, Lake Superior is to the right and a little above Lake Erie, but in the monument, as the illustration shows, it is below and to the left, this being necessary to balance the group artistically.

The group is to be called "The Spirit of the Lakes."



Symbolical of the Great Lakes

FIRST GAS-ENGINE LINER TO BE BUILT

The first ocean liner to use internal combustion engines is planned by the Hamburg-American line for a test in its Atlantic service. A vessel of 9,000 tons will be equipped with engines of 3,000 hp., which are expected to propel the craft through the water at the rate of 12½ knots per hour.

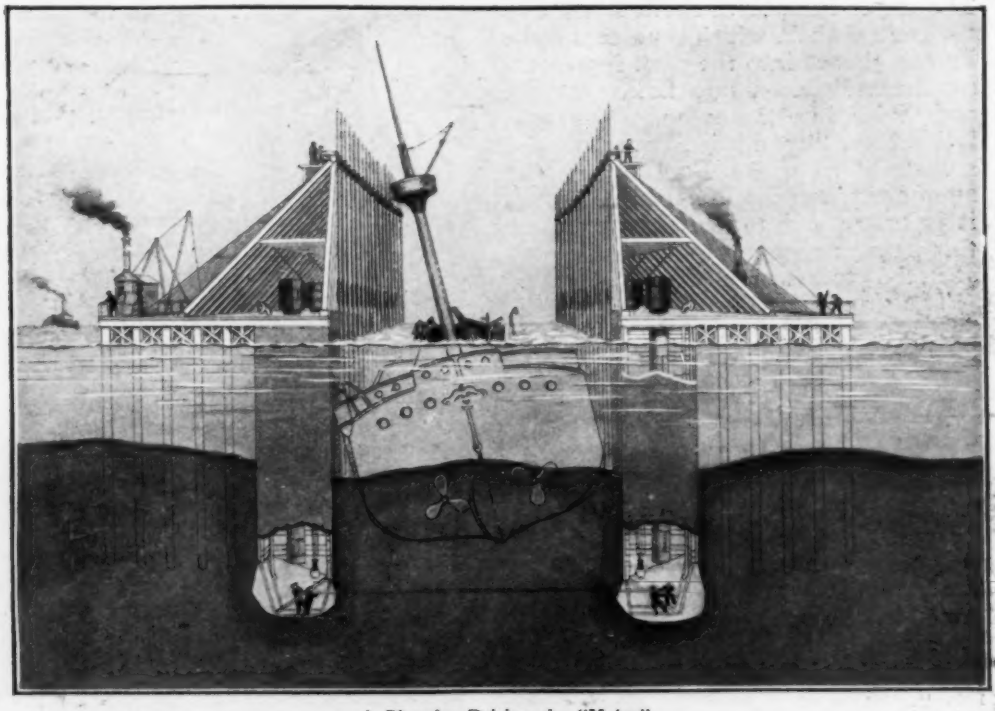
All of the best features of steam-driven ships are to be combined with the convenience and space economy of the gas engine. There is expected to be an enormous saving of space in the new liner by reason of the absence of boilers and smokestacks. The fuel storage sections will also be smaller than the coal bunkers would be on a vessel of this size. This will, therefore, give the ship a greater cargo-carrying capacity than any vessel of the same tonnage afloat.

The experiment is being watched with intense interest by marine engineers throughout the world. The engines to be used are of the Diesel type and will be two in number, each with a rating of 1,500 hp. The vessel will have twin screws. Crude oil will be used as fuel.

¶Money must not be sent in a letter to Greece. The person receiving the letter will be fined.

A PROPOSED METHOD OF RAISING THE "MAINE"

One of the most practical plans submitted to the War Department for the raising of the "Maine," for which purpose $300,000 was appropriated by Congress, is the idea of a New York engineer, who proposes to undertake the work for the government under the general direction of army engineers.



A Plan for Raising the "Maine"

The depth of water where the wreck lies is about 35 ft., overlying a soft, muddy bottom into which the hull has sunk another 10 ft. The New York engineer's scheme, briefly put, consists in raising the vessel on a cradle of cables, slung under it by means of 12 pneumatic caissons, placed six on each side. These caissons are to be 15 ft. wide by 40 ft. long, sunk side by side as near together as possible, and as close to the side of the wreck as the various projections will permit. The cables it is planned to pass under the hull number 60, so disposed that they may be simultaneously tightened and raised by derricks arranged on the docks.

The first step in the scheme is to drive, on either side of the wreck and about 20 ft. from it, an ordinary timber dock, supported by straight and battered piles, driven well down into the soft mud bottom. The plan calls for docks about 40 ft. wide, so that the outside edges will be about 60 ft. away from the vessel's sides. Between these docks and the sides of the hull the caissons will be sunk to a depth of about 10 ft. below the bottom of the hull. Pipes will then be driven under the hull from caisson to caisson, and the cables led through them, until all 60 are in place.

¶ Following an order from the Department of Agriculture, an attempt will be made to prevent importation of the English starling into this country. The starling is classed as an undesirable bird, being an eater of small grain.

EDITORIAL

AS aviation progresses, new and unexpected difficulties and dangers present themselves. The latest is that of destruction from lightning. While gas balloons have been frequently struck, it has been supposed there was some special attraction in the displacement of the air by a lighter body, which attracted the electric current by furnishing a course of less resistance to its passage. This theory may lose some of its force now that an aeroplane has been struck by lightning. Whatever the cause, the unpleasant fact remains that aeroplanes are not exempt, and that lightning rods to ground the current are impracticable. Rival lines of passenger airships may some day offer as a special advantage that their routes are laid through zones free from thunder storms.

* * *

THE Brennan monorail car, which maintains its equilibrium by means of gyroscopes, is making little headway in the direction of practical railroading. The system appears to have progressed to the point of demonstrating what can be done, but has failed to connect with any hard, every-day matter-of-fact service. At present, it is found among the flip-flaps, scenic railways and other amusement devices at the Anglo-Japanese Exhibition in London, but owing to unexplained reasons, is out of commission, being closed for "repairs" a good part of the time. Apparently the Brennan system is one of those interesting, curious things which, while they can be done, are not worth doing. Railroad managers in England do not consider the system seriously.

* * *

THE Post Office department, which only a year ago was on the verge of bankruptcy on account of the alleged enormous loss of carrying magazines and newspapers at one cent per pound, has managed by the introduction of business methods to reduce its deficit $11,600,000 for the fiscal year ending June 30, 1910. Inasmuch as no one claims there are any less copies of periodicals going through the mails than heretofore, the contention of the publishers that the deficit was caused by bad management rather than too low rates of postage, seems to be verified. If now all other branches of Government should be charged for their mail, as is done in most countries, instead of its being franked at the expense of the Post Office department, there would be little or no yearly deficit. A year ago this year's loss was predicted to be $20,000,000. It is only $5,500,000.

* * *

THE United States is about to undertake tutelage of the little republic of Liberia, on the west coast of Africa. It was founded in 1820 by the American Colonization Society as a home for slaves from this country who had secured their freedom. It became a republic in 1847. It now contains about 60,000 Liberians along the coast, and 2,000,000 wild negroes in the interior. With the consent of Liberia and approval of the leading European powers, the United States is arranging through American, French and German bankers to float a loan of $2,000,000 necessary to put Liberian finances in shape; the sum to be repaid chiefly from customs on exports, of which rubber is the largest. The United States will assist Liberia to get on a firm basis, by taking charge of its financial, military and agricultural departments, and foreign relations. English papers welcome the advent of the United States as a new power in Africa, and the Daily Mail says "this is a change which will affect future history as perhaps no other event in the last twenty years, with the single exception of the fall of Port Arthur." In Liberia no white man is allowed to acquire citizen's rights, or own property. It has no standing army.

* * *

AEROPLANE speeds started at 35 miles an hour and have increased to 66 miles. At the present time, a steam locomotive can outrun an aeroplane. However, air speeds of 100 to 200 miles an hour, are within the range of reasonable expectation; some aviators even seriously dream of 300 miles an hour. Further development seems contingent on engine construction.

Increased power with less weight is the demand, and must be obtained before any substantial increase in speed can be hoped for. The ratio of increased power necessary for each addi-

tional mile of speed per ton of ship, has been accurately determined. Whether high speeds through the air will be correspondingly extravagant of power is yet to be worked out. The problem of increased speed for aeroplanes is now up to the engine builders.

* * *

OWNERS of automobiles throughout the country are rapidly bringing upon themselves some rigid restrictions which they will not enjoy. Reform legislation is always slow in coming, and for that reason generally goes farther than is necessary. It seems to be a case of the breaking loose of pent up waters. The annoyances referred to are the unnecessary use of horns, whistles and exhaust. Many drivers seem to have a mania for making all the noise they can, lest some should fail to realize they are in a moving car. The smoke nuisance is equally unnecessary and offensive, and that it also can be prevented is demonstrated in nearly all European cities where heavy fines are imposed for violation. The result is a smoking car is seldom seen, for other drivers immediately call attention of the offender to his car.

The motorcycle is even more offensive in its noise making: This, too, is equally unnecessary. The motorcycles in England make no more noise than a sewing machine. The public has about reached its limit of endurance of these disturbances of the peace, and unless the offenders promptly reform themselves, city ordinances should and will be passed and enforced without regard to who the offender may be. This is an instance where a ten or twenty-dollar fine will work a prompt and permanent cure.

* * *

THE extensive peat undertakings which were started in Ireland about two years ago, on which large sums were expended, and of which so much was promised, have verified the prediction made in these pages and proved a failure. It is the old story over again, the cost of getting rid of the water, which constitutes 90 per cent of the weight of freshly dug peat, and the expense of a suitable binder to prevent the briquettes from crumbling before they are used, amount to more than the cost of coal. Attempts to make paper from peat were equally disappointing. It is evident that if peat is to become a practical fuel within the next one or two hundred years, it must be as the result of a different and cheaper method of digging, drying and preparing than any yet employed.

* * *

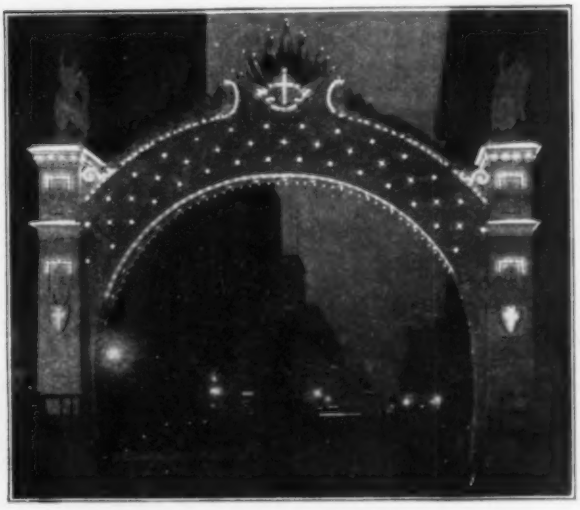
EXPORTS to South America, of goods and machinery made in the United States, are growing in volume each year, but at a rate far below our possibilities. Meanwhile Germany and England are becoming so strongly entrenched in those markets that we may never regain the lost ground, and if regained it will be only at great expense. One of our weak points is the self-confidence of our manufacturers as to the great superiority of our goods. In a few instances, like harvesting machinery, this is justified, but when it comes to articles of wear and household use, we make many mistakes. The form most popular here, and best suited to our own trade, is often very unsatisfactory to foreign buyers and users. Just as nations differ in the cooking and serving of their food, so they differ in their other wants. English and especially German manufacturers give great attention to this phase of foreign trade, and are not only willing but anxious to furnish an article in its most acceptable form. If a certain market demanded pails with two handles, the Germans would lose no time in argument as to the inutility of the extra handle, but promptly put it on—and charge accordingly. It is evident the man who wants a given article of a certain forming is going to buy it where he can get what he himself wants, rather than what some manufacturer thinks he ought to have.

The logical first step to any export trade is to visit the market sought, and learn at first hand what are its requirements. Getting into a foreign market is like planting a new kind of seed, which promises a large and valuable crop. With only a limited number of seeds, before breaking ground one would study all the details of its culture, and then take pains to plant in the right place, at the right time and in the right way.

Export trade requires the same treatment.

H. H. WINDSOR

One of the Columns



La Salle Street Arch at Night

On "Templar Way"

How Chicago Handled the Knights Templar Parade

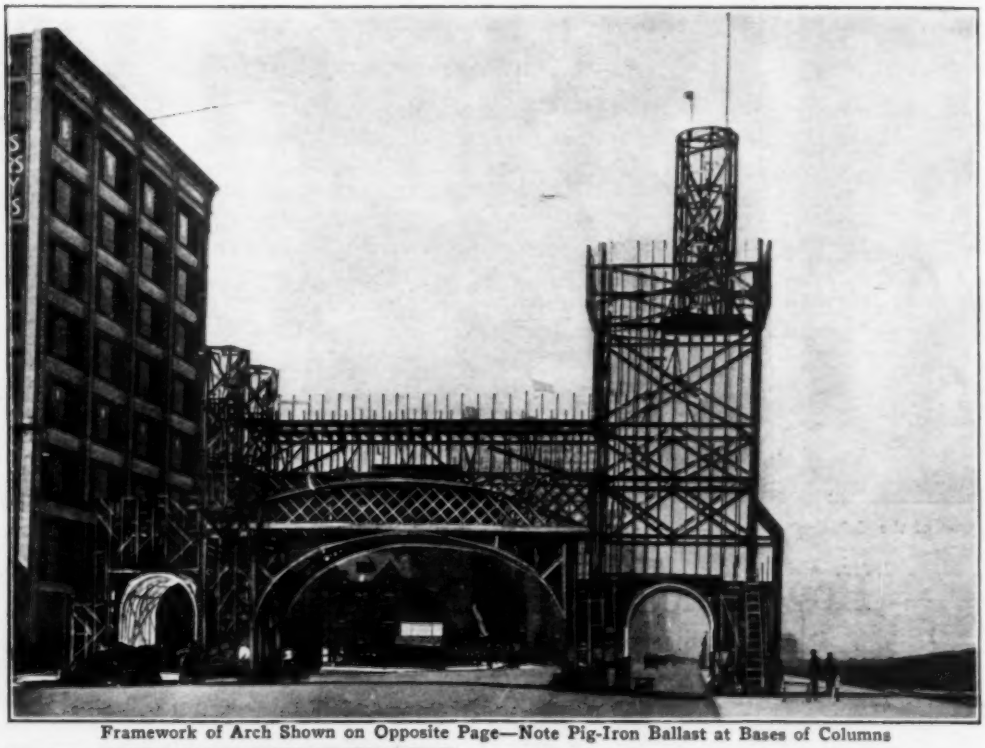
By HENRY W. RIDGE

THE services of an artist, a sculptor, an architect and an electrical engineer, in addition to riggers, carpenters and seamstresses are necessary in these modern times for the decoration of large cities planning to entertain thousands of visitors on occasions of great gatherings. So important has the business of decorating cities become that it is now a recognized trade, and there are eight big firms that practically control all the work done in the country.

The old system of promiscuous decoration, here, there and everywhere, has given way to carefully worked out schemes of symbolic character that carry through a general idea. The citizen will still deck his home as it suits his fancy, but the main streets of a city are now cared for by professional trimmers and builders employed by a general committee in charge of the affair.

The triennial conclave of Knights Templar in Chicago last month was made the occasion for the most lavish decoration of a city ever seen in the United States, with the exception of the Hudson-Fulton celebration in New York. It is estimated that $200,000 was expended on this feature of the entertainment of the knights. This work was done in sections by three of the largest companies in the business, each being called upon to look after the branch of the business in which it was most proficient. Ten carloads of material, in addition to the mass of bunting, flags, etc., obtained locally, were used. The general scheme followed the line of the big Templar parade, winding through the streets over which the route was laid and beginning on Michigan avenue and ending on La Salle street with massive arches, while the central portion of the plan included a long, straight "Templar Way" along State street, lined with stately pillars, festooned and connected with ropes of laurel.

The first of the arches represented the entrance to an ancient castle with its watch towers and battlements. Extending for a quarter of a mile from



Framework of Arch Shown on Opposite Page—Note Pig-Iron Ballast at Bases of Columns

Illuminated Sign, 70 ft. High

this arch was a reviewing stand with a seating capacity of 50,000, in the center of which was a canopied dais, where the Grand Master reviewed the marching hosts. At a central point was an illuminated Templar emblem, built on a framework 70 ft. high, the bottom of the emblem being about 15 ft. from the ground, so that, when illuminated at night, it had the effect of being suspended in the air. Along "Templar Way" the tall, white pillars alternated in the general scheme with black electric light standards from which floated colored pennons and Templar banners.

The arch at the end of the parade was a dignified white structure of imposing design, symbolic of victory and chivalry. Its principal features were two horsemen, placed on top of the huge, square columns that supported the span. These figures were life size and represented two knights, armed cap-a-pie, mounted on prancing steeds. They were pure white, as was the remainder of the arch. Of the two arches this last was the most expensive, al-

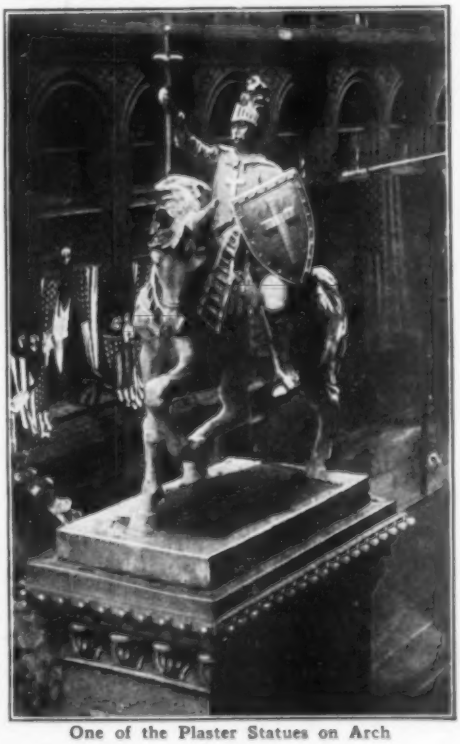
The "Templar" Arch on Michigan Avenue—Company of Arriving Visitors Passing Through

though it was not as large as the Michigan avenue structure. Its construction called for the services of a sculptor, as well as an artist and electrician. Skilled workmen were necessary to fill out the original models made by the artists.

In erecting the arches the builders could not anchor each column to the earth, as the concrete sub-base of the pavement could not be penetrated. The arches were built up of heavy timbers carrying latticed girders.

The main frame of each column in both arches consisted of a square base made of 10 by 12-in. timbers, on which six 6 by 8-in. uprights were set to carry the arched framework. A platform was built inside the rectangle formed by the uprights, about 1 ft. from the base in each of the columns. Six tons or more of pig iron were placed on each of these platforms as a ballast. No bracing was required in any way to keep the arches rigid.

The woodwork was covered with cloth, and the Michigan avenue arch



One of the Plaster Statues on Arch

was painted to imitate rough hewn stone. The casts for the horses and panels of the La Salle street arch were made up in parts and joined together when placed in position. The plaster was laid over hay and wire mesh attached to a light frame of metal. The metal parts were so arranged as to make them easily joined. After the parts were put together, the joints or seams were filled with plaster and smoothed over.

The handling of the crowd of 300,000 people attending the conclave was cared for in an exceptional manner by 1,600 members of the regular police force. With the exception of 25 detectives sent from other cities to help out the local force, no extra men were required for the work.

On the day of the great parade there was estimated to be a million people along the route of march, which covered five miles. There were 14,041 marching men in line, led by 64 bands, forming a procession 10 miles long. The streets through which the knights marched were roped off the night before, openings being left at crossings.

Seven ambulance stations were established at intervals along the route and there were patrol wagons posted at five other points. About the center of the line a temporary hospital was erected, these relief stations employing in all a corps of 100 physicians and nurses. These were designed to care for spectators who might become exhausted.

At the point where the route ended and the procession was disbanded, a platoon of 60 mounted policemen was stationed. These were re-inforced by 50 more mounted men, known as the "beauty" squad, which had led the procession. Cards which contained note of the number of men, and explicit directions as to the route they should follow returning to their headquarters were made out for each organization in the parade. These cards were made in duplicate, one being given to the commander of the organization named upon it and the other to one of the squad of 110 mounted policemen. As soon as the organization reached him, the policeman took charge of its march and led it back to its hotel, but by a different route from that taken by the preceding organization. The crowds on the streets naturally followed these retreating organizations with the result that as the big column broke into small integrals, and these units marched off in different directions, not only was an orderly retreat of the marchers accomplished without congestion of the thoroughfares, but the streets were cleared as though by magic of the throngs that had waited to witness the parade, the natural impulse to follow the uniformed men having been relied upon with perfect confidence for this purpose.

DEFINITIONS OF ENGINEERING

The definition of engineering most generally accepted until a year or so ago was that given by Tredgold in 1828 and embodied in the application of the Institution of Civil Engineers of Great Britain for a charter. It defines engineering as "the art of directing the great sources of power in nature for the use and convenience of man."

It has long been felt that his definition is not sufficiently comprehensive, and the definitions given by Henry G. Stout in his address as president of the American Institute of Electrical Engineers, and by Prof. G. F. Swain in an address at the Worcester Polytechnic Institute, are improvements.

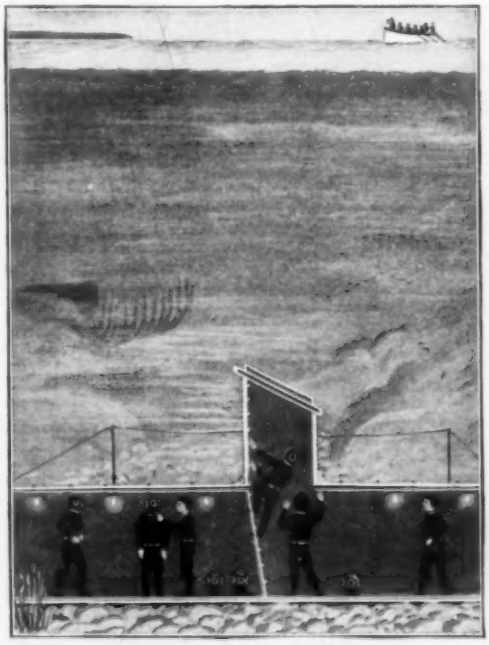
The former defines engineering as "the art of organizing and directing men, and of controlling the forces and materials of nature for the benefit of the human race." The latter defines it as "the science and art of applying, economically, the laws, forces and materials of nature for the use, convenience or enjoyment of man."

NEW MEANS OF ESCAPE FROM A SUNKEN SUBMARINE

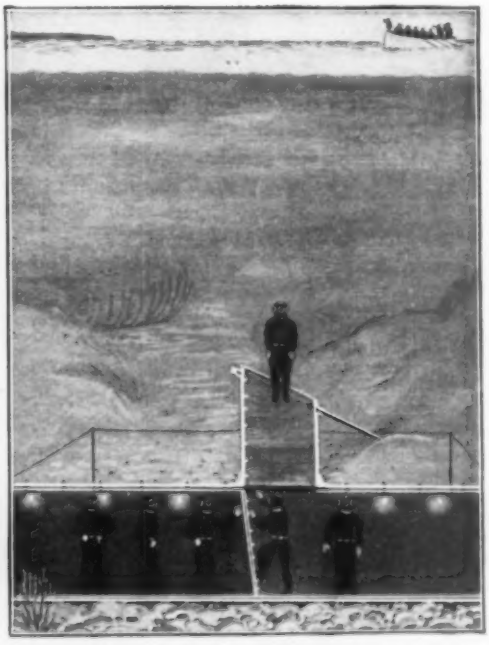
The fatal accident to the French submersible "Pluviose," in which the entire crew was trapped and drowned, has added impetus to the endeavors of inventors all over the world to provide adequate means of escape to the surface. One of the new types of apparatus advanced for serious consideration is the idea of a Baltimore inventor, who takes an airlock such as is used in caisson work and adapts it to the requirements of the submarine.

The Escape Tube and Its Inventor

It is a steel tube about 5½ ft. high, and 27 in. in diameter, provided with valves to allow the admittance and ejection of the water required to equalize the pressure inside and out. It is provided with a sliding door at each end, the upper one sloping at an angle of 45 deg., and sliding on roller bearings. In the interior of the tube, on one side, are rungs by which the escaping member of the crew may climb into position for escape, while a portable ladder gives access to the tube from the in-



Climbing into Position, Upper Door Closed, Bottom Opened



Shooting Up to the Surface, Top Opened, Bottom Closed

terior of the submarine. The method of escape is clearly shown in the illustrations. The lower door, shutting off the tube from the interior of the submarine, is opened, and one of the crew provided with a self-contained air helmet and jacket, climbs into position. Then the lower door is closed, water is let into the tube through the valves, the upper door is slid back, and the escaping member shoots to the surface. After the upper door is again closed, the water is forced from the tube by means of the valves, the lower door is opened, and a second member of the crew ascends.

MINNESOTA'S INDUSTRIAL PROSPERITY

Substantial industrial prosperity is responsible for the reduction of taxes throughout the state of Minnesota contemplated by the state officials this fall. The mines, the railroads and the varied branches of manufacturing that find home in the state have justified the predictions of the officials that a decrease in the levy on the individual citizen would result. They have backed their prediction with the flat statement that at least half a million less in revenue would be necessary next year, and are taking steps to reduce the levy to one-half mill, the lowest in the history of the state.

Minnesota derives its revenue from a tax of four per cent on the gross earnings of the railroads, on the earnings of other corporations, and a direct levy of one mill on all taxable property, including the iron mines. This year the first named source netted the state $4,000,000 and the last mentioned $1,100,000. There was also paid into the treasury this year $800,000 of deferred railroad taxes that had been in litigation and $345,000 of inheritance tax.

The iron mines, or land containing iron mines, are assessed under an ad valorem basis to the amount of $205,000,000. A portion of the mines are on state lands held under lease, the lessee paying 25 cents a ton royalty for each ton of ore. This income goes into what is known as the permanent trust funds for schools, the university and swamp lands. These funds are kept as perpetual funds and only the interest can be used.

TO TEST EFFECT OF FORESTS ON STREAM FLOW

The recent clash between the United States Forest Service and the Weather Bureau over the question of the effect of forests on river stages has drawn attention to the fact that there is but few real data on the subject. Consequently, these two departments of the government are to undertake a joint series of investigations expected to take about 16 years.

The plan is to make a very complete study of the effects of forests upon stream flow, erosion, disposition of silt, etc., as well as their possible meteorological relations, on two watersheds of similar topography near Wagon Wheel Gap, Colorado, in the Rio Grande National Forest. The dams and instruments for the measurement of the stream flow, together with complete equipment of meteorological apparatus, will be installed at an elevation of 9,500 ft. above sea level.

The intention is to measure the flow of the two streams for a period of about eight years, which is long enough to show, with similar forestration, the behavior of the two streams. Then one of the watersheds will be cleared, and further measurements will be continued for another period of eight years. Thus the effects of the removal of the forests can be determined by comparing the results of observations in the two tracts.

¶Only one passenger was killed in the United Kingdom during the past year by an accident to a train in which he was traveling.

WONDERFUL BUDDHIST CAVE-TEMPLE

About three hours' journey from Bombay, India, in the face of a steep cliff, is a curious Buddhist cave-temple, an interior view of which is here illustrated. It is considered one of the largest and most complete specimens of the Buddhist "chaitya," and was probably built 78 years before Christ, by Maharajah Bhutia.

The interior architecture—there being, of course, no exterior architecture—resembles to a remarkable degree that of the Gothic type. It is not unlike the Christian church in form, consisting of a nave and side aisles terminating in an apse. Some 15 pillars separate the nave from the aisles, and the capital of each is richly ornamented with the figures of two elephants bearing a man and a women or two female forms.

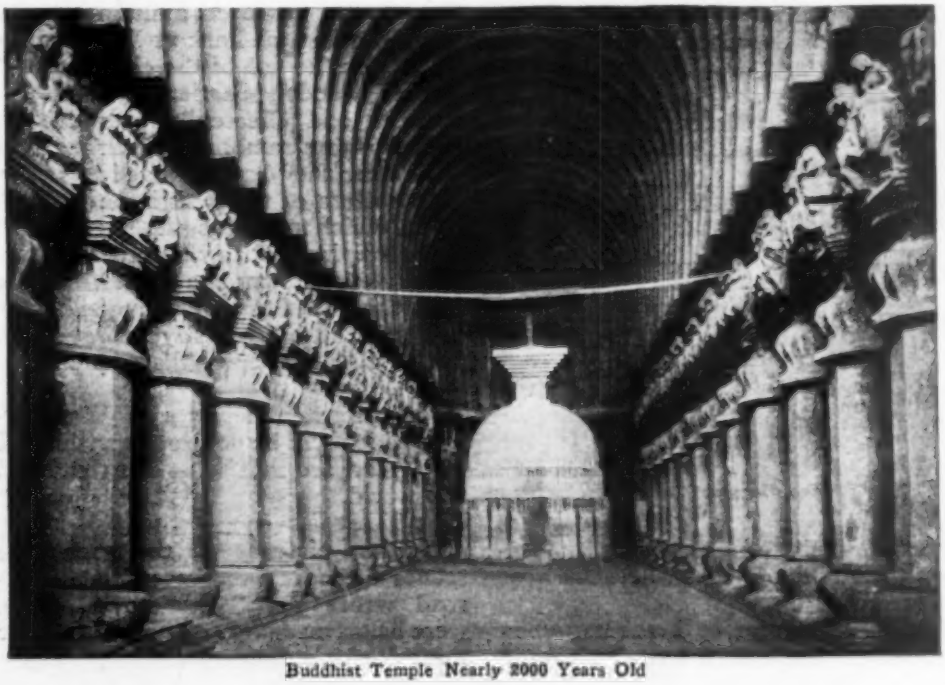
The method of lighting is very solemn in its effect. An undivided volume of light comes through a single opening overhead and falls on the altar, leaving the rest of the temple in comparative darkness.

UNIQUE PHOTOGRAPH OF BEAR CUBS

Among the prisoners at the Federal jail in Seward, Alaska, are two bear

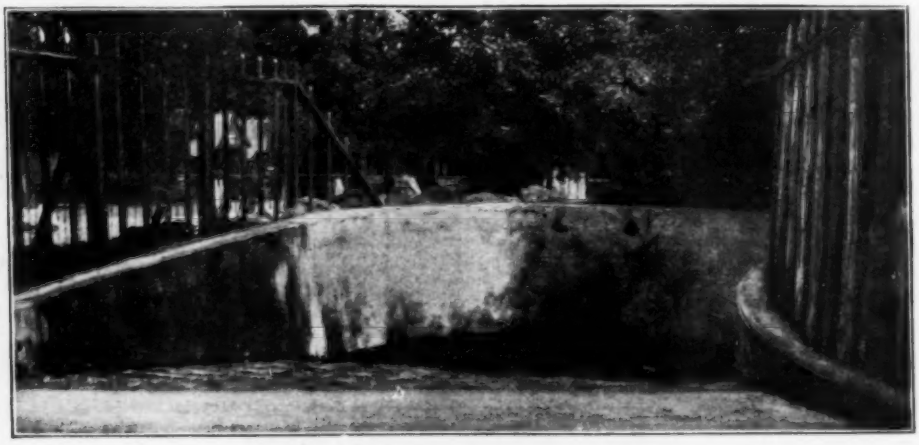
Bear Cubs Fighting It Out in Seward, Alaska, Jail Yard

cubs belonging to one of the attachés of the place. The little fellows are firm friends ordinarily, but they have their little differences, just as do their human fellow prisoners. One of these



Buddhist Temple Nearly 2000 Years Old

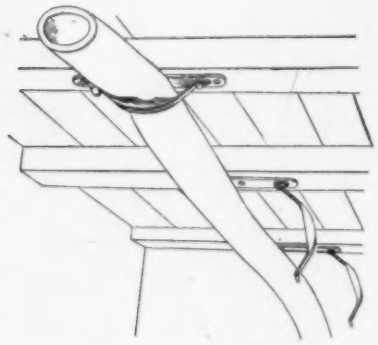
little squabbles gave opportunity for a remarkable photograph which showed the two bears standing erect just ready to "go for" one another, their attitudes suggesting the positions of two prize fighters sparring for an opening.



Where the Government's Elephants Bathe

AUTOMATIC HOSE BRACKETS

A fire-hose clamp which protects the hose when not in use, and brings it into play automatically when water passes through it, is drawing much attention, especially for use on steamships,



Hose-Hanging Clamp

wharves, railroad terminals, warehouses, and other places where fire hose is required.

The hose clamps or brackets, when fastened to the deck beams, bulkheads or floor rafters, hold the fire hose ready for instant use, but the pressure of water through the hose at once releases the latter, allowing it to drop to the floor, deck or foundation below. How the swelling of the hose accomplishes this is clearly shown in the illustration.

BATHTUB FOR ELEPHANTS

A huge concrete bathtub, 40 ft. wide and sloping down to a depth of more than 15 ft., has been built in the National Zoological Park at Washington, D. C., for the use of the elephants. A strong wooden barrier encloses the bathtub and effectually prevents the animals from rambling off through the park after they have enjoyed their dip. The bottom of the tank is paved with rock, which prevents the big fellows from slipping, as they surely would do if they tried to maintain their balance on a concrete floor covered with slime.

The bathtub has vastly improved the health and temper of the elephants.

¶The tungsten deposits in Washington, which will be developed within the next year, are said to be the richest in the world.

¶Moving pictures of the grewsome scenes attending the recent fatal railroad wreck near Middletown, Ohio, were being made less than an hour after the collision occurred.

PLAN TO REMODEL BRITISH ROYAL RESIDENCE

All England, and especially London, is interested in the idea of either remodeling or completely rebuilding Buckingham Palace, the royal residence in London. The front of the palace, which is constructed of Bath stone, has a peculiarly forbidding aspect. It is not considered a fit residence for the ruler of a great empire, and is an eyesore to London. It is said, in fact, that not a sovereign in Europe has such an unsuitable residence.

Many of the organizations and persons behind the movement to provide a suitable royal residence in London believe that the initial conception was so entirely faulty as to make impossible any alterations in the present structure. Others insist that the interior has many admirable features, and that the outside appearance can be so remedied that it may be possible to enlarge and remodel the palace in time for the coronation of King George next year. Complete rebuilding would require a much longer time.

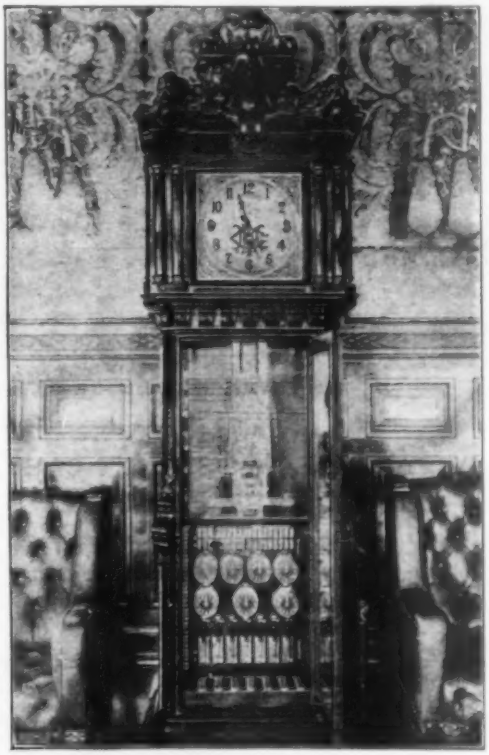
THE WORLD'S OUTPUT OF METALS

The world's metal statistics, compiled annually in Germany, give the production for the year 1909 as follows: The production of copper was 844,100 tons, or an increase of nearly 100,000 tons over 1908. Of this amount the American output was 498,200 tons, and the American increase over 1908, 66,300 tons, or more than half the total increase for the whole world.

The output of lead amounted to 1,081,900 tons, of which the United States produced 339,700 tons; the output of tin was 108,300 tons; the production of zinc was 783,200 tons, of which the United States was responsible for 240,446 tons; the total output of nickel was 16,100 tons, the United States being credited with 9,000 tons, and the output of aluminum was 24,200 tons.

MASTER CLOCK A MASTERPIECE OF THE CRAFT

The master clock, which is the heart of the time-keeping system in the Met-

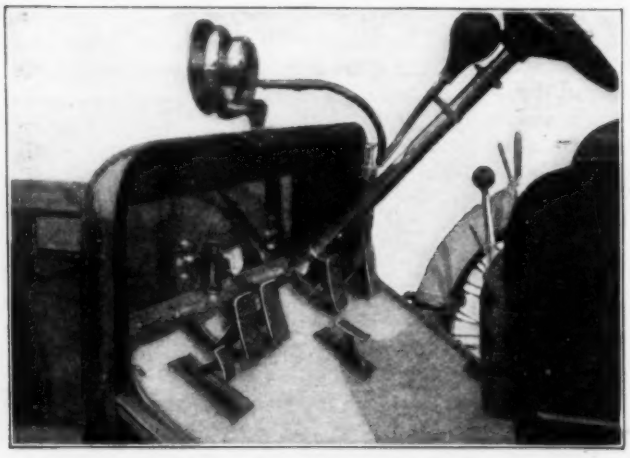


Regulates Clocks in the Metropolitan Building

ropolitan Building, New York, regulating the enormous clock in the tower as well as a hundred others throughout the building, is a beautiful specimen of the clockmaker's craft. Various instruments for sounding bells in different parts of the building at scheduled hours are also controlled by this clock. It is so delicately adjusted that it never varies more than five seconds a month. Installed within it are numerous controlling devices, from which impulses are transmitted every minute to the tower clock, 346 ft. above the sidewalk, keeping it in perfect synchronism with the master clock. It is located in the directors' room of the building.

¶Rural letter carriers will be receiving tellers for postal savings banks.

SPECIAL AUTO FOR TRAINING BEGINNERS



Auto Provided with Double Set of Controls

A special training automobile, with which it is possible for the instructor to turn the steering wheel and control mechanism over to his pupil and still retain control of the car, is here illustrated. This is accomplished by means of the extra set of clutch and brake pedals, and the special "d e c e l e r a t o r" pedal.

The automobile was equipped in this way for the beginners' department of the Royal Automobile Club, London.

DEVICE ALLOWS STREET CARS TO RUN OVER FIRE HOSE

A simple contrivance that fills a long felt want in cities where there are many trolley lines and railroad tracks, has just been introduced in the Boston fire department. As is the rule in all large cities, fire hose laid across railway or railroad tracks are "sacred," and must not be crossed by cars. This has resulted in a general tie-up of traffic at times, cars being stalled for hours, or delayed by having to take a roundabout route.

A track section, built up on a strong T-shaped plate and beveled down at each end, enables a car to pass up from the regular rail, over the hose and down again without injuring it, and to continue on its way without interfering with the work of the fire apparatus. This is used where auxiliary lines of hose are laid across tracks that are not within the fire lines. Of course it is not used where there would be danger if the car entered the fire zone, which is kept cleared to enable the firemen to fight the flames, as heretofore. But where many hydrants are tapped outside the immediate fire lines, as is necessary during a big fire, it is invaluable, keeping traffic moving, and the streets in the vicinity of the fire clear for the apparatus. The hose passes under the crossover section, which is built high and strong enough to protect it. Every blockade costs a trolley company hundreds of thousands of dollars, which can now be saved by this simple device.

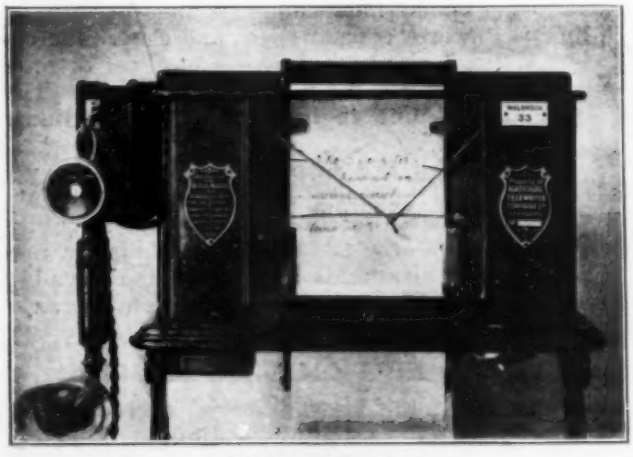
Prevents Street Car Blockade Caused by Extension of Fire Hose Over Tracks

TELEWRITER ATTACHED TO TELEPHONES TRANSMITS HANDWRITING

The "telewriter," an apparatus by which handwriting may be transmitted over a wire to distant points as fast as the person at the sending end of the wire can write, is being attached to a telephone service in London. It works in connection with the telephone without any interference with the ordinary service, the connection being automatic. Lifting the telephone receiver makes connection with central, and lifting the pencil throws the telewriter into service.

Sending Apparatus

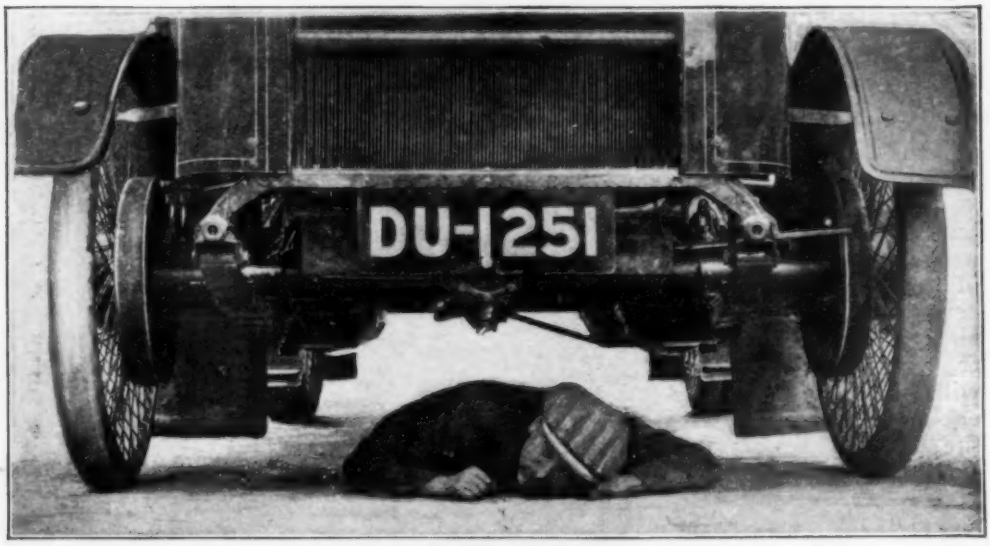
If a person telephones another and finds him not at home, all that is necessary is to take down the pencil and write a message, which is reproduced on a similar roll of paper at the other end of the line. The arms of the pantograph connected with the transmitting pencil regulate the electrical currents which are sent over the wire to the receiving pencil. The synchronous movement of the pencils thus produced transmits letters, figures or drawings in the exact penmanship of the writer.



Receiving Apparatus

OIL NUISANCE IN HARBORS

The steadily growing use of fuel oil on British ships has resulted in polluting the harbors to such an extent that the Admiralty has ordered that all possible precautions be taken to prevent leakage or discharge into the waters of all British ports. A ship due for the periodical survey of hull, and requiring to empty her oil fuel tanks for the purpose, must communicate with the captain of the dockyard and naval store officer, so that arrangements can be made for an oil storage vessel. As much oil as possible is to be discharged into the storage vessel, care being taken to avoid leakage overboard through the hose connections. The ship must then flood its tanks, and, if practicable, proceed to sea to pump the oil and water overboard. Otherwise, she must anchor outside the harbor in such position that the oil be carried well out to sea, pumping being done at ebb tide.



Remarkable English Motor-Bus

ARTISTIC ARROWHEAD MADE IN RAILROAD SHOP

This beautifully designed arrowhead was conceived and executed by the material supervisor of the San Bernardino

Indian-Head Arrowhead

shops of the Santa Fe Railroad, and was displayed on the machine shop float in the San Bernardino Valley Centennial parade.

MOTOR-BUS HAS A UNIQUE POWER PLANT

This motor-bus, which is now being operated in London, is constructed on a novel system, and has a power plant entirely different from that of any like vehicle. Each driving wheel is propelled independently and directly by worm transmission, and a gasoline engine and electric motor, directly coupled, form each power unit. The gasoline engines are of the 4-cylinder type.

All the suspended parts of the vehicle consist of one steel structure, which greatly increases the strength, while the absence of transmission mechanism underneath gives the bus a big clearance, as the illustration shows.

NEW CHINESE COINAGE

If the latest imperial decree is carried out as expected, China will have a vastly improved coinage system, with coins comparing with the American dollar, half, quarter, dime, nickel and cent, and additional coins worth approximately 2 cents, 5 mills and 1 mill. The standard will be silver and the unit of the national currency will be the "yuan," which corresponds to the American dollar, its value being $1.008.

TRAINING THE STEAMSHIP CAPTAIN OF TOMORROW

SEVERAL of the transatlantic steamship lines, notably the North German Lloyd and the White Star, have special ships on which their future officers are trained for service, and these ships are propelled by sails instead of by steam.

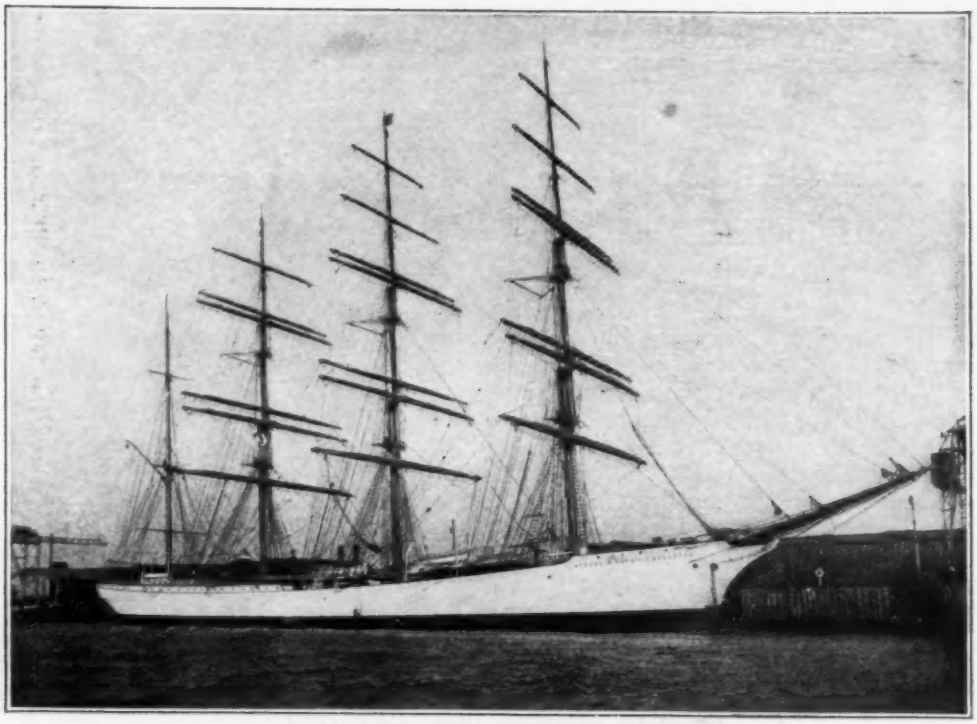
Why the officers of huge steam-driven ships should be trained on comparatively small sailing vessels, instead of upon ships of the type they are intended to navigate, may not be quite clear to the average landsman, so it is well to state that it is because of the lack of opportunities for training them efficiently on the latter. In fact, it is only in the past few years, owing to the ocean-carrying trade having been largely transferred from sailing vessels to steamers, that special training ships have been considered necessary.

The North German Lloyd line has two training ships, "Herzogin Sophie Charlotte," and "Herzogin Cecilia." The former is a four-masted barque of 2,395 tons' carrying capacity, and the latter a four-masted barque of 4,400 tons' capacity. To make the training adequate and thorough, the number of cadets on board either ship at one time is limited to 50.

The length of service required of the cadets on these ships is three years, after which they spend a year on one of the regular steamers. This advances them sufficiently to enter the naval school for further preparation for the examination in navigation. When they have obtained their navigation certificate, supposing, of course, that they show themselves generally efficient and competent, they obtain posts as fourth officers on the regular steamers of the line, as far as vacancies allow. They are not, however, under any obligation to take service with the line. After two years further service, a second stay of four or five months at the naval school is necessary to pass the examination in higher navigation, which completes the theoretical studies. The certificate for higher navigation (captain's certificate) gives the right to the independent command of merchant vessels on all seas and waters.

Young Navigators Receiving Instruction at Wheel

The White Star line training ship is the Clyde-built clipper ship "Mersey." Her length is 271 ft., and she registers as 1,829 tons. The cadets are received between 14 and 17 years of age, and are articled for four years. On the expiration of their apprenticeship, they are eligible to pass the Board of Trade examination for second mate's certificate, and on obtaining same are qualified, and have preference for appointment as junior officers on the steamers of the White Star, Leyland, Dominion, and Atlantic Transport lines. Promotion is granted thereafter according to conduct and ability, the intention being that the cadets will remain in the service, passing through the various grades until they become eligible for promotion to senior officers of the watch.



North German Lloyd Training Ship

Part of Graduating Class of "Herzogin Sophie Charlotte"

Merchant Marine Cadets at Lifeboat Drill on Training Ship

In the ship school, the pupils are under a head master. The studies include English grammar, composition, history, geography, arithmetic, algebra, plane and spherical trigonometry, navigation, nautical astronomy, compass deviation, meteorology, marine surveying, drawing, charts, ship construction, and French or German.

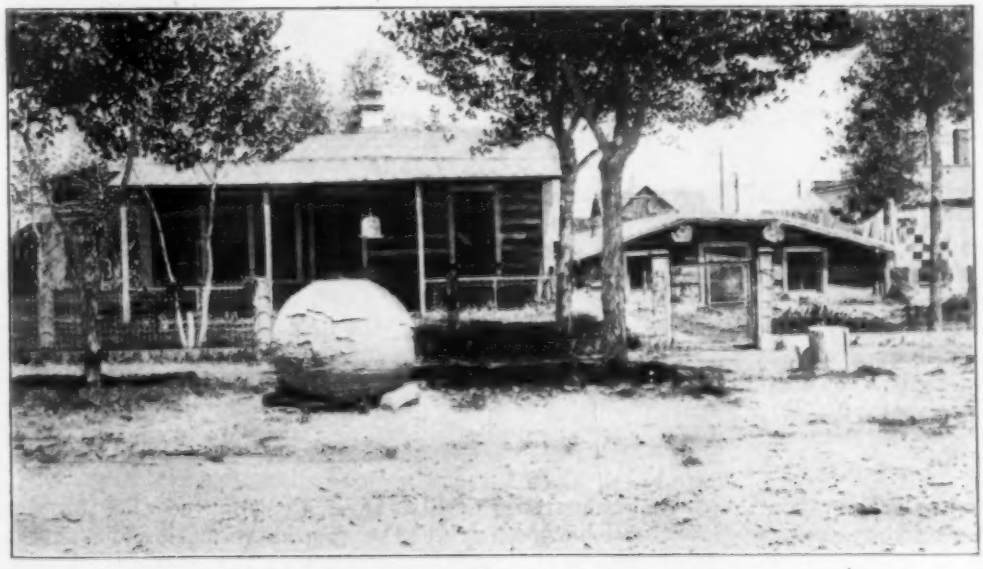
Lectures are given on naval architecture, construction, outfit and measurement of boats, charter parties, keeping of log-books, etc., also on the different qualities of coal, steam raising, and the rudiments of steam engines. The cadets work the ship under the commander and his officers, and in their ordinary duties become familiar with the practical handling of vessels, making and taking in sail, repairing, bending and unbending sails, steering, etc. While in port the cadets are taught swimming, smail boat sailing, discharging, receiving, stowage, ventilation and care of cargo, surveying, mooring, and laying out anchors.

Under the head of nautical construction the following subjects are taught: rope knotting, splicing, stropping blocks, moving heavy weights, the use of hand and deep-sea leads, of the patent sounding machine, hand and taffrail logs, compass adjustment, use of sextant, observations of sun and stars, signaling, rule of the road, fog signals, lighthouses and tides.

The cadets are divided into three watches, so that each watch will have eight hours' rest each night, in addition to keeping their four-hour watches on deck, and having four hours in school.

A UNIQUE HITCHING-POST

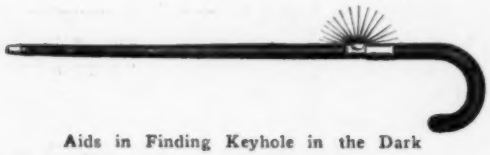
Both the stone and the house shown in this illustration are interesting curiosities. The house was the first built at Basin, Wyoming, and the stone, which has a ring in its top and is used as a hitching-post, was found in exactly its present shape on the bank of the Big Horn River. It is a solid piece of sandstone, measuring about 3 ft. in diameter, and weighing about 2,000 lb.



First House in Basin, Wyoming, and Its Ton Hitching-Post

WALKING STICK WITH ELECTRIC LIGHT

An interesting novelty is a walking stick provided with an electric lamp of the pocket flashlight variety. The pos-



Aids in Finding Keyhole in the Dark

sibilities for its use are numerous, as situations continually arise in which illumination is necessary for the moment. Such, for instance, as looking at a watch, or finding the keyhole in the dark.

SMALL SEARCHLIGHT FORTS TO PROTECT BATTLESHIPS

A system of searchlight forts, first tested by the French navy, by which battleships in a roadstead may be encircled by a complete ring of light, is said to have many advantages over the ordinary method of illumination guard in which the ships use their own searchlights.

Warships at anchor in an open harbor offer opportunities for a sudden attack by hostile torpedo boats at night, therefore powerful searchlights are usually utilized to illuminate the surrounding waters. These searchlights, however, give the enemy the exact position of the ships they intend to attack, while the searchlight-fort system forms a ring of light around them, without betraying their exact location.

The searchlight forts are placed sufficiently close together to allow the projecting beams of light to meet, and the light is projected close along the surface of the water, so that there may be no dark patches through which the enemy might slip.

¶A falling bulb of a 40-watt tungsten lamp in the show window of a Chicago store is blamed for setting fire to the dress goods on which it fell.

THE NAVY EXPERIMENTING WITH THE GYROSCOPE

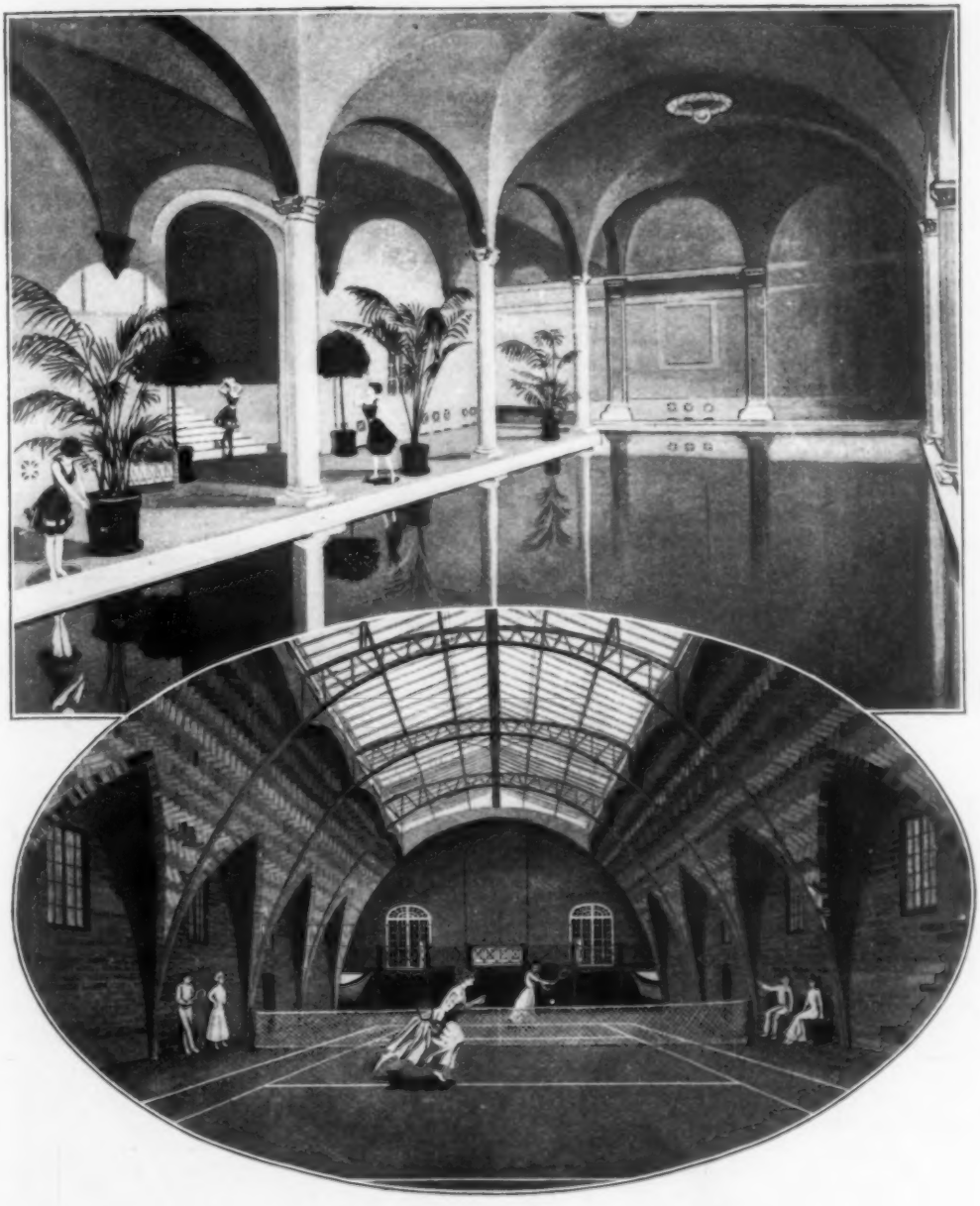
The beneficial results of the installation of the gyroscope on board ships of war have led the Navy Department to purchase one. It has been installed, for purposes of trial and observation, on board the U. S. S. "Birmingham."

The cost of the gyroscope is about $10,000, owing to the fact that it is obtained from German manufacturers. An effort will be made to establish a domestic source of supply, if the gyroscope proves of the practical utility claimed for it. Its use on board the submarines would be of particular advantage, and, with the conditions prevailing on the battleships, it might lead to decided economy in doing away with the non-magnetic metal, which costs so much more than ordinary steel. Gyroscopes have been installed on some of the ships of the German navy.

Following the successful trials of the English and German gyroscope monorail cars, a Russian has announced the completion of such a car, driven by steam instead of gasoline. The inventor is the governor of Kostroma, and his work is said to be the result of many years of study and experiment. Among the special features of his monorail car are a device that automatically corrects all oscillation, and a gyroscope that can be run at a speed of 800 revolutions per minute, instead of several thousand, and does not require a vacuum, as do the English and German inventions. It is also said that no particular perfection of workmanship is required.

Other recent developments in monorail cars are a truck, which converts vertical and horizontal oscillations into oscillations all in one plane, and a coupling, which keeps trailers perfectly upright as long as they are attached to the gyroscope car, but which allows perfect freedom in running up or down gradients and around curves.

¶Milwaukee has adopted the thumbprint system of identification as a check against forgery in the payment of city employes.



Inclosed Tennis Court on Astor Estate and the Swimming Pool

A MILLIONAIRE'S GAME BUILDING

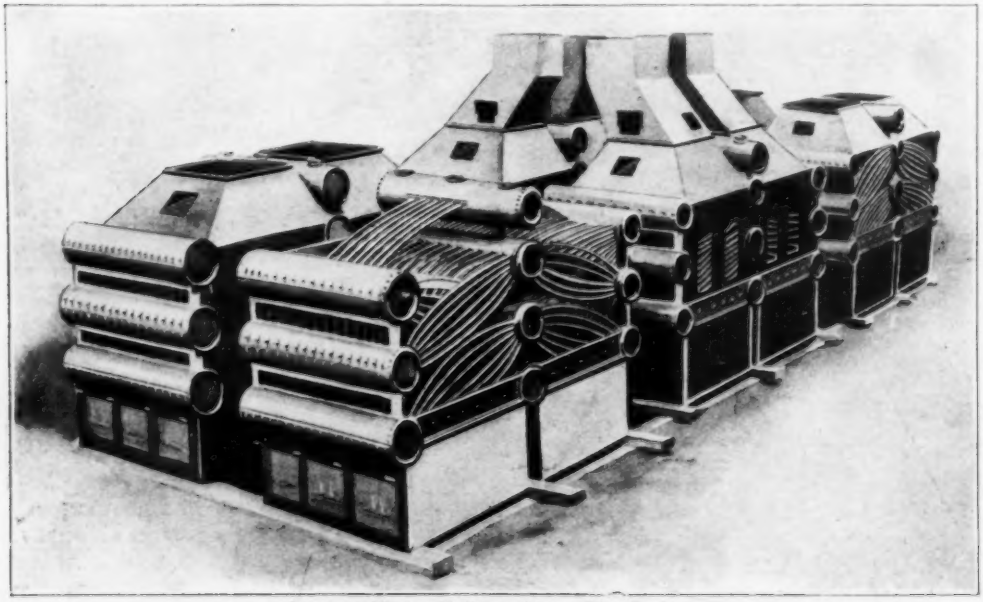
One of the finest examples of private buildings constructed for the indoor playing of tennis and squash is to be found on the estate of John Jacob Astor at Rhinebeck, N. Y.

The building is T-shaped, with a tennis court occupying the long member of the "T." Dressing rooms form one side of the head, and the other side is formed by a squash court, swimming

pool, and men's dressing room. In addition to these is still another squash court on the main floor, a large reception hall, a number of bed chambers, and a living room. On the basement floor are still more bedrooms, a kitchen, and other departments.

The clay floor of the tennis court is the result of a considerable amount of study in order to get the quality of earth which would withstand conditions under a glass roof.

The outer walls of the building are constructed of stuccoed brick, the foundation is of rubble stone, and the roof is slate.



Japanese Marine Boilers without Flat Surfaces

WATER-TUBE BOILERS OF JAPANESE CRUISER

The marine water-tube boilers used in the majority of Japanese warships are built without flat or stayed surfaces, the entire boiler consisting of drums and curved tubes. Due to the arrangement of the nests of tubes, it is very elastic and accommodates itself to the changes due to expansion and contraction.

This type of boiler is claimed to be the only one used in the entire Japanese navy which can be kept under steam for six months without cleaning the inside. The boilers in the illustration are for the Japanese cruiser "Mogami."

UNITED STATES EXPLOSIVE MOST POWERFUL IN WORLD

That the United States army has the most powerful explosive and most perfect type of gun in the world was made known recently by General Frederick Dent Grant, commander of the Department of the East.

"Why, we've had the most powerful explosive of modern times for more than a dozen years waiting for guns strong enough to shoot it," says General Grant, "but nobody could devise the gun. Well, we've got the gun now, and we're using the explosive in it. I have just looked the new gun over and it is the most perfect in the world this minute."

¶ The importations of precious stones in the United States in the last fiscal year were $44,885,057, several millions higher than the previous record year, 1906.

Will Store 650,000,000 Gal. Water

—

Will Wipe Out Five Existing Settlements

The Ten-Million-Dollar Irrigation Project in New Mexico

By

L. WILLIAM THAVIS

Will Also Irrigate Land in Old Mexico

—

Will Inundate 180 Square Miles of Territory

HAVING just completed the Roosevelt dam of the Salt River irrigation project in Arizona, the greatest engineering feat of the age, at a cost of nearly $9,000,000, Uncle Sam will now turn his attention toward the construction of a similar project in New Mexico. It will be a great reservoir at Engle, connecting two diversion dams, one located at Leasburg, and the other 120 miles north of El Paso, Tex.

The Engle reservoir and its diversion dams are intended to harness the waters of the Rio Grande River and be of far greater magnitude than the Assuan dam of the Nile River, Egypt, now reputed the greatest irrigation project in the world. The Engle reservoir alone will hold twice as much water as the Nile River project, will be 40 miles in length, and reach an average width of nearly four miles, varying from three to six miles. In it will be stored approximately 650,000,000 gal. or 2,000,000 acre-feet of water. The entire flow of the Rio Grande for three years will be required to fill the reservoir. The cost of the Engle dam will reach far more than $10,000,000 when completed.

The construction of the Engle reservoir will wipe out five settlements, besides inundating about 180 square miles of territory in New Mexico. While this general basin and its two diversion dams are located in New Mexico, the

Looking Up the Rio Grande River through the Dam Site—Dotted Lines Show Immensity of Dam Which Will Be Built

lands to be irrigated lie partly in New Mexico, partly in Texas and partly in the Republic of Mexico.

The main dam construction work of the Engle reservoir will be 1,200 ft. in length at its crest and about 20 ft. in thickness. Its greatest height will be 275 ft. above the bed of the river. Reinforced concrete will be employed throughout.

Until a railroad 15 miles in length is built, little work can be done on the dam, for the reason that most of the machinery to be used is too heavy to be moved by any other method than on rails. Moreover, a small army of men must be supplied with the necessaries of life for two or possibly three years, and this alone would be a great undertaking, should it have to be done over the ordinary road. At present 150 men are employed at Engle, but this force will be augmented to about 2,000, as soon as work on the dam commences in real earnest next spring.

The construction of the Engle dam will involve the following general features: building of the branch railroad; construction of plant, quarters and other buildings and accessories; building of the main flume and cofferdams; excavation of the sluicing tunnel; excavation in the river bed and for the abutments; making and placing the masonry of the dam; construction of the power station and transmission lines; building an embankment at the gap in the hills northwest of the dam; permanent buildings, roads, etc.

A large portion of the Engle dam contract will involve the excavation of the river bed and the preparation of the foundation at a distance of 60 to 80 ft. below the normal river bed. This will not only be hazardous work, but its extent and character can not be predicted. The foundation has been carefully sounded with diamond drills, but, nevertheless, experience shows that unexpected conditions are likely to develop and plans must be changed from time to time in the preparation of foundation.

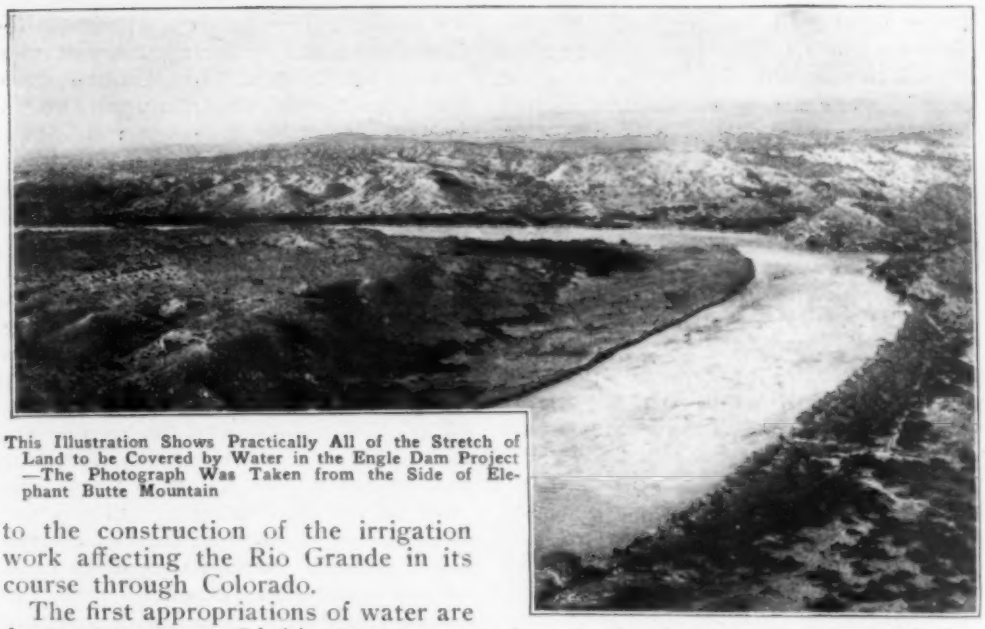
The Rio Grande project lies in central and southern New Mexico and Texas. The source of water supply is the watershed of the Rio Grande, which takes its rise in central Colorado and flows southward through the middle of New Mexico, so far as El Paso, Tex., whence it becomes the boundary between the United States and Old Mexico, until it empties into the Gulf of Mexico. The Rio Grande is formed by numerous streams, which flow into it from the high mountains of Colorado and New Mexico, and the plan is to construct a reservoir of sufficient size to store all of the rainfall of three years on this vast watershed.

In its course the river flows through large areas of forest, and in the mountains outlying are rich deposits of gold, silver, copper, lead and coal. Occasionally, the course of the stream lies through wide plains. North of El Paso, the valley of the stream is bound by rugged mountains, near or remote and here, in southern New Mexico and Texas, are the areas which the project is designed to irrigate.

The Leasburg diversion dam already has been completed, and water has been diverted into canals by it, since the spring of 1908. This water is sufficient for about 25,000 acres of Mesilla Valley, and 13,000 acres more of that valley are irrigated by the community plan. The Leasburg dam takes the place of two former community headings. Above the Leasburg dam, about 5,000 acres of Rincon Valley are watered by community canals. The same system is employed in El Paso Valley.

It will be possible to irrigate from the Engle reservoir several millions acres of very fine valley land suited to the cultivation of practically every crop. The dam will also prevent the heavy spring floods, which in the past have caused a great deal of anxiety and damage along the Rio Grande River each year.

Before the project could be carried out, an agreement had to be reached between this country and Old Mexico. By its terms the United States gives to farmers along the Mexican bank of the river as much water as they used prior



This Illustration Shows Practically All of the Stretch of Land to be Covered by Water in the Engle Dam Project —The Photograph Was Taken from the Side of Elephant Butte Mountain

to the construction of the irrigation work affecting the Rio Grande in its course through Colorado.

The first appropriations of water are for 180,000 acres. Of this, 25,000 acres lie in Old Mexico, and the remainder in New Mexico and Texas. The United States reclamation service promises water for no more than 180,000 acres, but the local water users' association expects that there will be enough for 200,000 acres. Of this area 110,000 acres lie in New Mexico, 45,000 acres in Texas, and 23,000 in Old Mexico.

Looking Down into Elephant Butte Valley on Camp of Workmen Engaged in the Work of Building the Huge Dam

Elephant Butte Mountain, Below Site of Dam—Crest Gives Impression of Elephant Lying Down, with Head to Left

By a treaty between that Republic and the United States in settlement of claims on account of prior rights to the waters of the Rio Grande, the United States agrees to deliver at the border, for these 25,000 acres, 60,000 acre-feet a year. For this, Congress has appropriated directly from the treasury the sum of $1,000,000. The rest of the lands, 156,000 acres, pay the government for the project in ten annual installments. By the terms of the reclamation act, no person may have water for more than 160 acres, but he must pay the annual installments for all the land he may own. This means that a person who may own more than 160 acres will have to sell it.

In regard to the interest of the water users under the Rio Grande project, who will eventually have to pay the major part of the cost of construction of the dam, the time required in its construction is a very important item. It has been conservatively estimated that the value of the Engle reservoir to them will be equal to the net profit on the use of 100,000 acres of land now producing nothing, which the reservoir will make it possible to cultivate. Even though the whole of this land would not be immediately put in cultivation, the time when it will be all in cultivation would be brought one year nearer by each year saved in constructing the dam. The net profit on this land in alfalfa alone, at present prices, would be at least $25 per acre, or $2,500,000 per annum on the whole acreage.

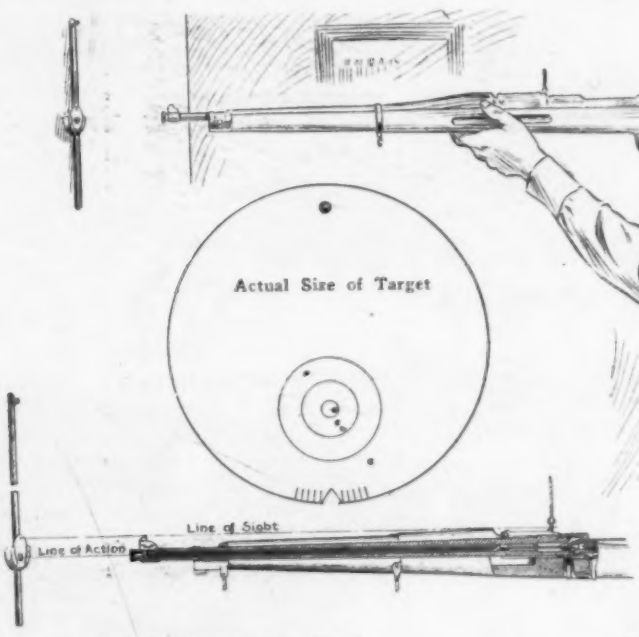
The history of the Rio Grande Valley is the history of New Mexico. Before the advent of the Spaniards under Marco de Niza, in 1539, this territory had been the home for untold generations of sedentary tribes of Indians, as well as nomadic predatory tribes. Many ruined pueblos and houses of stone in the shelves of the rocky cliffs attest to this period of settlement. Following Niza, and guided by him, Francisco Vasquez Coronado came to this country in 1540, and used the valley of the Rio Grande as a base for his explorations into what is now Arizona, Texas and Kansas, the Grand Canyon of the Colorado, one of the wonders of the world, having been discovered in one of these expeditions. From this time on, the history of this valley is one of conquest and revolt, the Indians not being entirely overcome until the close of the seventeenth century.

Thenceforward New Mexico grew in importance, new towns being established in the Rio Grande Valley, where the colonists learned to make use of the crude but often extensive irrigation works that had been established, probably centuries before, by the aboriginal inhabitants. Early in the nineteenth century a considerable trade sprang up with the settlements along the American frontier, notably Kaskaskia in Illinois, and Franklin and Independence in Missouri. This was the beginning of the overland commerce over the famous Santa Fe trail, and was, in fact, the cause of its existence, the trail being abandoned when the Santa Fe Railway entered the territory, in 1880.

MARKSMANSHIP OF SOLDIERS IMPROVED BY USE OF PIN PROJECTILE

A new and ingenious means of improving the marksmanship of soldiers has been adopted by the U. S. army, air pressure and a pin projectile being substituted in the ordinary army rifle for cartridges, thus eliminating noise and danger. A rod, fitted into the gun barrel, is driven forward by a spring, sending the hammer home after the fashion of the air-gun, and a sharp pin projection on the end registers a dent in the target. This target is a miniature affair made of cardboard, about 2 in. in diameter, on which are circles

surrounding a small bullseye. The target is slipped into a piece of grooved tin, mounted on a rubber pad an inch thick, which is supported by a pendulum-like rod. It may be suspended on ordinary boards hung on the wall of a room or porch.



Spring Arrangement in Barrel

Target Practice Indoors

The instructions given by the department for the use of the device are as follows: The target should be set about level with the eye, with notch in edge engaging point at bottom of holder. Set rifle sights for 200 yd. and aim at upper spot on sub-target, holding muzzle of rifle about 8 in. from target. Snapping the bolt drives pin out from the barrel and scores a record. The target may be turned either way in holder, bringing any of the graduations adjacent to the point to allow for error in eyesight. These graduations correspond to the windage on rifle sight.

Tests made by the army experts show that the system will perfect marksmanship almost as well as the regular target practice, and it has the further advantage that it can be used by the soldiers at any time or in any place.

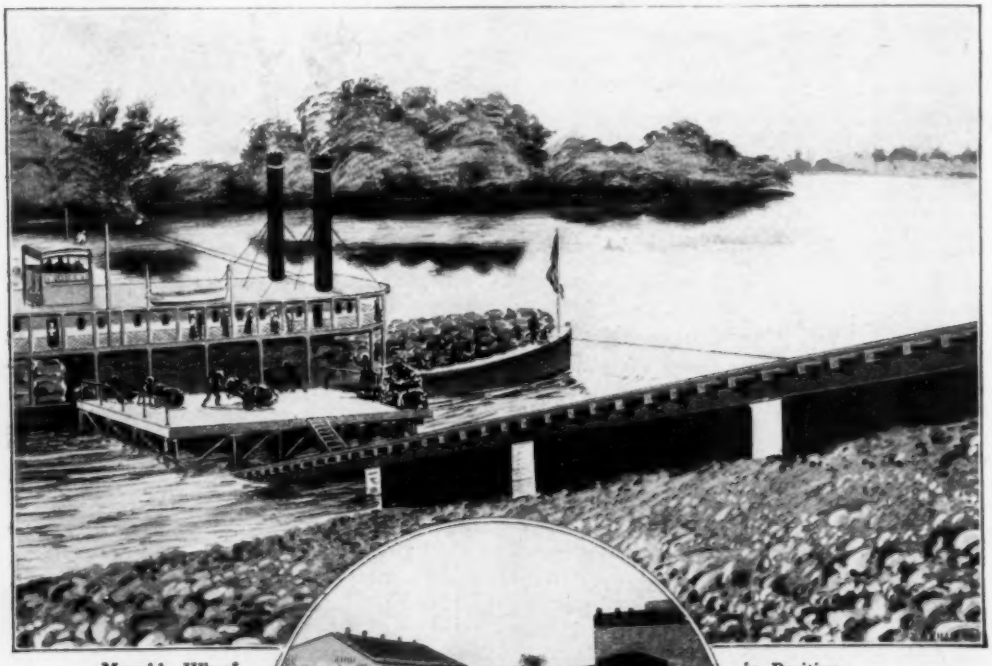
WORKING LIFE OF BIG GUNS ONLY FOUR SECONDS

The average person, if asked the actual working life of big guns, would probably give a guess in at least days or weeks, if not in months, and would be dumbfounded if told that the average is only four seconds. Yet this is a fact when you figure the actual working life as the time in which the projectiles are passing through the guns.

A 12-in. gun is destroyed by erosion of the bore after 100 projectiles have been fired, the erosion commencing with the first shot and gradually impairing the power of the gun until the end. The average mean velocity of the projectile is half the muzzle velocity, or about 1,200 ft. per second. The length of the gun is 45 ft., which means that 26 projectiles traveling 1,200 ft. per second only take one second to pass through the gun. At this rate, 104 projectiles could pass through in four seconds' actual time, while the life of such a gun is only 100 projectiles as above stated.

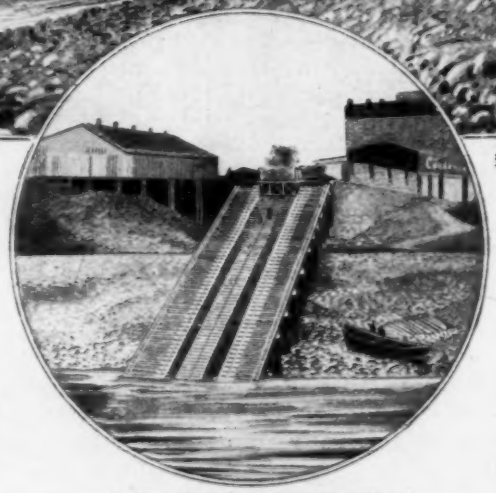
ADJUSTABLE INCLINED UNLOADING WHARF

The city engineer of Montgomery, Ala., has devised a unique wharf for use on rivers subject to great variations. The arrangement was adopted by the city of Montgomery, and is now in active and successful operation.



Movable Wharf in Position

It consists of a double railway-track incline, set on concrete piers, and leading from a warehouse on the bank of the river to the lowest water level. On the double track is a movable wharf, so mounted that its platform is level. This platform is lowered or raised with the rise and fall of the water, so that the river boats may lie alongside and load or unload at all stages.



Incline Tracks of Movable Wharf

On the same incline, operating independently of each other, are two electrically-controlled cars which are used to transport the cargo being loaded or unloaded from the warehouse to the movable wharf.

The water level of the Alabama River varies many feet during the year, and a fixed dock that would be available at one time might be 15 or 20 ft. above or below water level at other times, causing loss of time and money.

¶The "colonial" style of interior decoration is to form the principal scheme of the finish for the new Cunard liner "Franconia," launched in July at Walsend, England.

LUBRICATION PRESERVES WIRE ROPE

Lack of proper lubrication is the greatest cause of disintegration of wire rope. The corrosion is particularly noticeable on the inside wires of the strands, due to the fact that the lubrication has failed to penetrate to them.

The scientific lubrication of wire rope, according to the American Wire Rope News, is a matter which has not been given the attention it deserves. A wire rope is very complex, requiring constant lubrication not only on the surface, but inside of the strands. Many wire ropes fail because of the complete corrosion of the inside wires, while the outside wires are apparently in good condition.

THE AEROPLANE CAMERA

Several types of cameras are now being made especially for the purpose of taking snapshots from, and of, aerial craft. The machine illustrated is one of the best examples. For use in the air it is mounted on the frame of an aeroplane in such a position that the second man in the machine may focus it on the country underneath. When used on the ground, it rests upon a tripod and is aimed at the object in the air in very much the same way as a rapid-fire gun.

Photographing an Aeroplane with the Camera

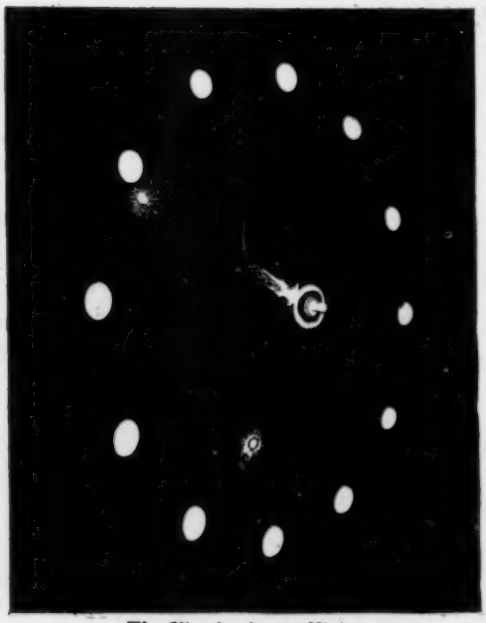
Mounted on an Aeroplane

LARGEST GOLD-ORE CRUSHING BATTERY IN WORLD

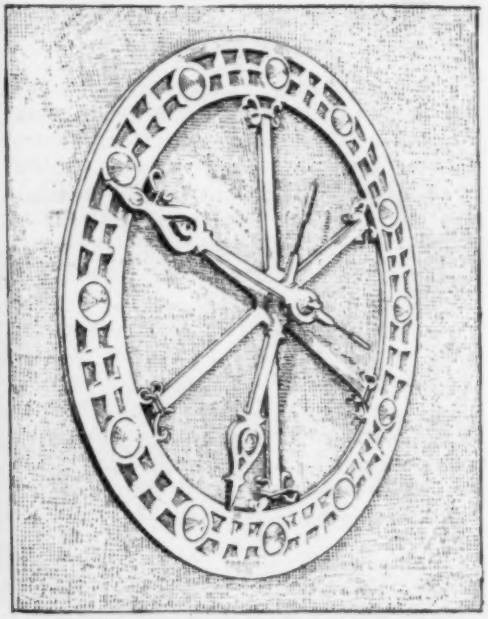
The great gold-ore crushing plant recently erected in the Transvaal, Africa, is said to be by far the largest in the world. The battery contains no less than 600 stamps, each with a falling weight of 1,650 lb. The length of the structure housing the plant is 634 ft.; the width, 69 ft.; and the height, 62 ft. Thirty motors are required to drive the stamps.

The mortar blocks rest on a mat of bitumastic concrete, the object of this being to dampen the vibrations, which would otherwise be transmitted direct to the surrounding ground. The bins, which are constructed of pitch pine and lined with steel sheeting, have a capacity of 13,000 tons of rock.

The mill is in the Witwater sand district, which is said to be the greatest gold-producing center in the world at the present time.



The Illumination at Night



Appearance of the Clock by Day

AUTOMATIC ELECTRIC TARGET FOR SHARP-SHOOTERS

An interesting mechanical device used at the recent great rifle meet at Bisley, England, in which the Empire and Freemantle cup contests were the drawing cards, was the automatic electric target shown in the illustration.

It consists of an electric truck on which are mounted the figures of a

Electrically Propelled Target

soldier and a deer. The truck runs on a narrow track which curves in and out, thus continually changing the distance.

MONSTER CLOCK WITH ELECTRIC DISK DIALS

The mammoth electric clock erected in the tower of the Federal building at Newbern, N. C., has several unique features, the most interesting of which is the arrangement of the dials, which are without numerals to indicate the hours. Instead they have 12 opalescent glass disks, which will show white in the daytime, and will be illuminated at night. Back of each disk is an electric lamp, backed by an aluminum reflector. There are openings behind each dial to permit the renewing of the lamps, and the dials may be revolved to bring the several lights in front of the openings, so that they may be reached. These are said to be the first dials ever made so that they can be revolved.

The framework of the dials is of wrought-iron construction, with cast-metal circles to hold the disks. The hands are made of cast aluminum, with an electric light at the hub, and one near the point of each hand. These lights show red to distinguish them from the dial lights.

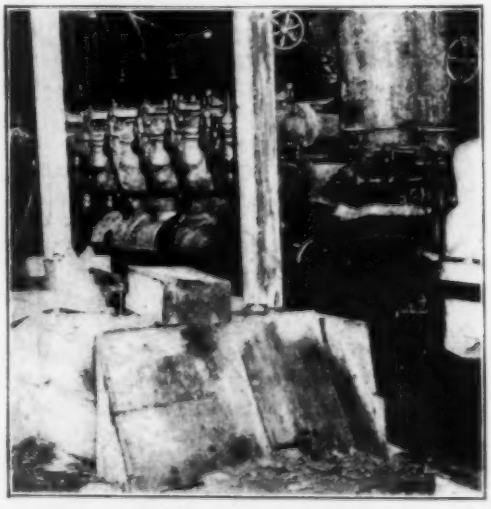
SPECIAL TELEPHONE DEVICE AS ARMY SCOUT

Considerable interest was evinced in recent maneuvers of the National Guard in the utilization of telephone wires provided with special sound-magnifying transmitters as a means of determining the strength and movements of the enemy.

In the experiments, the transmitters were concealed along the roads over which the troops representing the enemy might be expected to pass, and concealed wires were used to connect them with signal corps stations. In this way the sound of the approaching troops could be heard at a distance, and their strength determined by the period of time they could be heard marching past.

PUMPING OUT A SUBMERGED MINE

The fall of water shown in one of the accompanying illustrations is pumped from the Tombstone Consolidated mines in Arizona, which were flooded by a breakdown of the pumps at the 1,000-ft. level. Between 6,000,000 and 7,000,000 gal. are pumped from the mines every day, which would be more than enough to supply the town of Tombstone and irrigate the nearby truck farms and orchards. The pumps which failed and are now under water are shown in the other illustration.



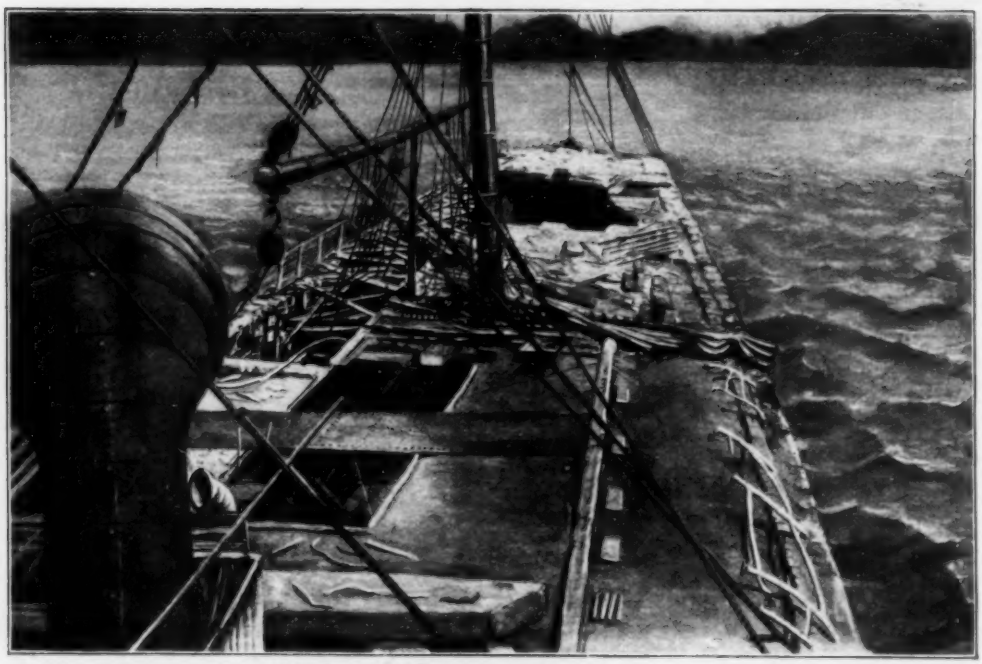
The Pumps That Failed

Great Volume of Water from Flooded Mine

The gold, silver and copper mines in Cochise County, Arizona, are continually threatened after a depth of 500 ft. has been reached, by underground lakes and springs. The pumps have to throw out immense volumes of water, and when a breakdown occurs the result is very likely to be serious.

NEW STEEL ALLOY USED FOR TELEPHONE DIAPHRAGMS

A new steel alloy metal is being so successfully used for telephone equipment in England that several of the telephone companies in this country are now testing it for receiver diaphragms. It is called "stalloy," and its chief characteristic is that the addition of three per cent silicon increases the resistance of the alloy to about three and one-half times that of the ordinary transformer iron, so that the eddy current, when it is used as part of the alternating current magnetic circuit, is greatly reduced.



Damage Caused by Ice Floes

SALVING A VESSEL IN ICE FLOES

One of the most exceptional cases of salving in the records of Pacific Coast shipping was recently carried to a successful conclusion in the raising of the S. S. "Yucatan," a 336-ft. steel steamer, wrecked in Icy Straits, off the coast of Alaska, last February.

The salvage steamer "Santa Cruz" reached the wreck on Feb. 19, but was unable to get alongside because of the ice. Boat crews dodged in and out whenever the ice receded with the tide sufficiently to give them an opportunity to work, and by this continual fight with the ice, the vessel was prepared for raising. For a period of two weeks, the salvors made "hurry up" rushes at the job, working a couple of hours at a time, and then being driven back by the ice. Divers who went down from the steamer's boats had many narrow escapes, the floating ice often threatening to interrupt their air supply. During March and the early part of April, the divers were continually working under the ice, while boat crews fought to keep the floes at a safe distance from the air hose.

Ice played havoc with the wrecked vessel, completely covering the after part, and carrying away the deckhouses. The stern was stove in and the deck frames crushed out of shape, while surging ice soon gutted the after part from the engine room casing aft.

EXTENT AND KIND OF TRAVEL ON MASSACHUSETTS ROADS

A traffic census conducted by the Massachusetts Highway Commission on the 740 miles of state roads, to determine the relative importance of the different routes of travel and the number and type of vehicles passing over them, gave the following results:

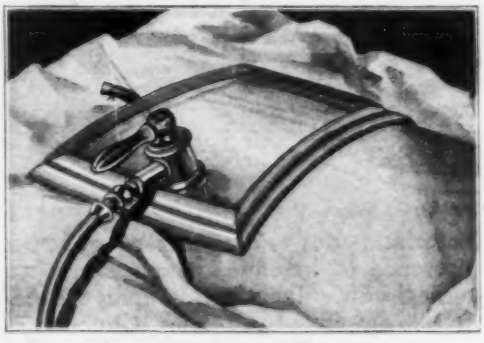
The census was taken during one month from 237 stations or points of vantage. The number of light horse-drawn vehicles, which means a buggy,

carryall, democrat wagon, etc., used for pleasure or light business purposes, recorded was 19,622. The heavy horse-drawn vehicles reached a total of 17,969, while the number of automobile touring cars recorded was 21,387, and the runabouts, 5,922. This gives a total of 64,900 vehicles seen and recorded from the 237 stations.

PNEUMATIC SHIELD FOR OPERATIONS ON THE LUNGS

In operations on the chest, either pleural cavity, and even the partition between them, as a rule, may be invaded without causing death, but it is a satisfaction, according to a writer in the Journal of the American Medical Association, to have an apparatus handy that is capable of almost instantly removing the condition of pneumothorax (air or other gas present in the chest cavity).

Such an apparatus is here illustrated. It is an aspirating shield, a simple inflated rubber rim, in which is held a flexible celluloid window. A two-way cock connects the cavity of the shield, at will, with either the external air or a vacuum tank. To overcome pneumothorax, the shield is applied over the wound and the lever turned connecting the vacuum tank with the cavity of the

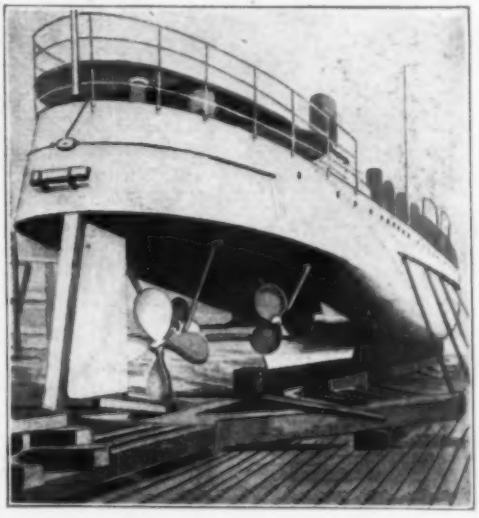


Pneumatic Shield as Aid in Lung Operations

shield. A form of artificial respiration may be produced by alternately producing and relieving the pressure in the cavity.

FRENCH DESTROYER WITH TURBINES AND RECIPROCATING ENGINE

This French torpedo-boat destroyer, with its peculiar-appearing stern and



Peculiar Hull of French Destroyer "Voltiguer"

its arrangement of propellers, is driven by a very interesting arrangement of turbines and an engine of the reciprocating type. On each shaft is a high pressure turbine mounted on wheels, with a low-pressure turbine mounted on the drum. The steam is admitted into the turbines at several points, lowest speed is given by longest expansion, and variations in speed are obtained by opening different valves and a single steam-cock.

The reciprocating engine is used for cruising speed, and drives the central propeller. When running at low speed this engine and the turbines are connected, the steam, after expanding in the reciprocating engine, being delivered into the turbines. The most economical power is thus obtained at speeds up to 23 miles an hour, above which each engine works separately.

¶Laundry tubs are now made of cement, which is stronger than the stone used for that purpose. If broken, they can be mended.

SIGNALING UNDER THE SEA

One of the submarine signal bells with which British lightships are provided is here illustrated. It is on the Tongue lightship and when rung conveys a warning beneath the waves to all vessels fitted with the required receiving apparatus.

Bell That Rings Out Under Water

NEW GAS FOR NON-DIRIGIBLE BALLOONS

An interesting new method of preparing gas for non-dirigible balloons has been adopted at Chemnitz, Germany. It consists of forcing illuminating gas through long tubes, maintained at a high temperature. Most of the carbon in the hydrocarbons is separated by this means, and the percentage of hydrogen is largely increased. At the same time, the gas is deprived almost entirely of the characteristic odor and also freed from the presence of benzine, which exerts an undesirable solvent action upon the materials employed to render balloons impermeable.

A balloon with a capacity of 7,000 cu. ft., when inflated with this gas, is said to have a lifting power equal to that of a balloon of 10,000 cu. ft., charged with ordinary coal gas.

HEAT

Part IX—Energy and Fuels

By J. Gordon Ogden, Ph. D., Professor of Physics, Fifth Ave. High School, Pittsburgh

[This is the eighth article of a series by Dr. Ogden, in which well known subjects will be discussed from the standpoint of their relation to modern mechanics. The following subjects were discussed in the months indicated: February, "The Nature of Heat and How It Is Measured;" March, "How Low Temperatures Are Produced;" April, "Some Effects of Low Temperature Upon Matter;" May, "The Production and Uses of High Temperature;" June, "High Temperatures and the Rare Metals;" July, "How Heat Travels;" August, "How Heat Is Measured;" September, "Expansion and Contraction." Succeeding articles will include Steam, Boilers, Ice, Radiation, etc.]

THE fairy tale of yesterday is the science of today.

In our wide-eyed childhood days we pored eagerly over the wonder stories of the Brothers Grimm, or listened with awed attention to the prodigies and marvelous deeds of Baron Munchausen and Sindbad the Sailor. Well do we remember the man by the wayside who refused to doff his hat as by doing so a killing frost would blight everything in his vicinity; likewise do we call to mind that other happy individual, the fortunate owner of the famous seven-league boots, who was able to walk comfortably around the earth in a single day.

All these wonderful tales sink into insignificance beside the simple facts of modern science. A few turns of wire whirling in front of a magnet, and lo! we have a light that rivals the sun in its intensity, or a silent power that turns all the wheels in our factories. A whisper in New York may be heard in Chicago. The President of the United States touches a button in Washington and ponderous machinery is energized in the far off Philippines.

A steamship far out at sea flashes "C Q D" into the murky fog of the night; instantly sister ships, scores of miles across the horizon, respond and turn their prows in her direction. A few buckets of water confined within an iron box will carry a heavy locomotive and its train of Pullmans 60 miles an hour. A few pounds of piano wire and a dozen yards of muslin enable us to go sight seeing into the very air itself, outwinging the birds in swiftness of flight. A few tiny bits of curved glass tell us the exact composition of suns and stars billions of miles away in the vast expanse of the heavens.

Whether it be electricity, magnetism, steam, wood, coal, oil or gas that is the direct agent in the production of power,

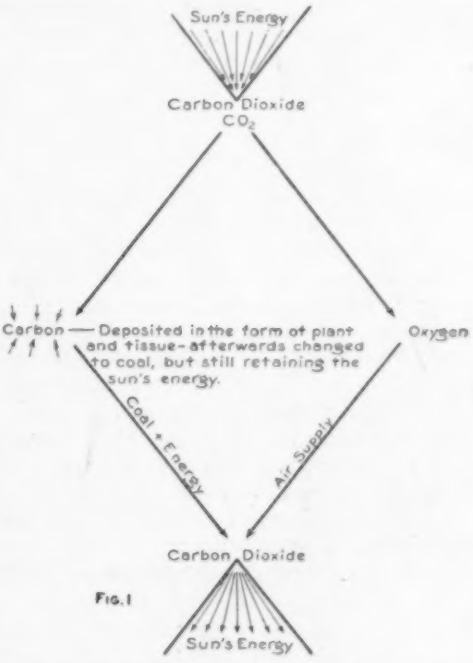


FIG. 1

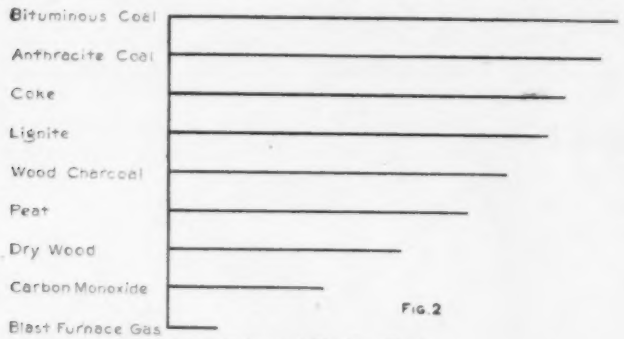
Diagram Showing the Storing of Energy in Coal, and its Release in After Ages by the Addition of Oxygen

it is the sun, after all, that is the source of all the energy in the world. For ages and ages the sun has been bathing the earth with her radiant energy, and storing up for us in mighty caverns enormous supplies of energy in the form of coal, oil and gas. To look at a bit of coal, grimy and stony in appearance, one would hardly suspect that it is practically preserved sunlight and heat. Let us look a little into this matter of coal, and attempt to account for its wonderful properties, and learn just how it received its fuel power.

First of all we must bear in mind that

Copyright by H. H. Windsor.

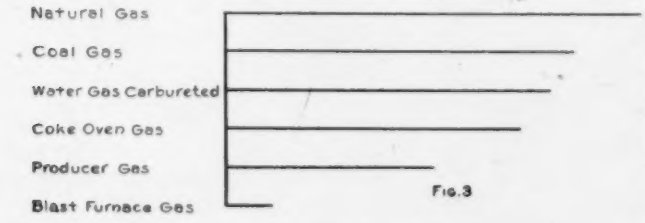
even as matter is indestructible, so is that strange and mysterious something known as energy. Even as there is just as much matter in the universe to-



Relative Values of Various Fuels

day as there was in the beginning, there is just as much energy. No energy is ever lost except in a practical sense. The stones that were carried to the very pinnacle of the Great Pyramid, retain to this day the energy of position, given to them ages ago by workmen who have long since turned to the dust whence they sprang. The Washington monument is not only a memorial to America's greatest citizen but it is also a storehouse of work done.

Coal was formed from plants that flourished millions of years ago and which were prevented from oxidation



Relative Fuel Values of Several Gases

by the fact that they fell into swamps and morasses and were covered with a protective layer of water. Afterwards they were entombed under billions of tons of sandstone, limestone and clay. The resulting pressure and heat caused the vegetable matter to assume the form of coal in which state it is familiar to us. Clearly it was not the water, nor the pressure that gave the coal its store of energy. It must have received it while it was still a member of the plant world. Wood will burn. Grass will burn. Corn will burn. All plants will burn. Coal was formed from plants.

Evidently plants are the storehouses of energy. How do they get it? In this way: A plant cell is a chemical laboratory whose secrets have been, and still are, the envy of every chemist. When the sunlight aids it, a plant has the power of chemically combining water with a gas known as carbonic oxide, the same gas that is given off by animals in breathing. The product of this composition is known as starch, cellulose, or woody tissue. While the plant is able to form the actual combination of gas and water, it is the sun's energy after all that gives it the power to do so. The sun does the actual work, using some of its own energy in the operation. To raise a pound one foot, requires one foot-pound of energy. To do any kind of work, physical or chemical, requires energy which may be stated in terms of foot-pounds.

The energy of the sun in helping the plant in its work of chemical combination, is just as much work and of practically the same kind as that put forth by a laborer in carrying a hod of bricks up a ladder. And even as the energy used by the laborer remains at the top of the ladder, so does the energy used by the sun remain within the wood built up by the plant and the sun. When the wood, or what is the same thing, the coal, is placed under proper conditions, namely, sufficient heat and abundance of air supply, the wood returns to its original components, water and carbonic oxide gas, and the sun's energy that has been imprisoned within the wood or coal is set free in the form

of heat, the lowest form of energy. Look at the diagram shown in Fig. 1, and the simple changes and transformations will be readily understood. As is the story of wood and its wonderful power of locking up energy, so is the story of oil, of natural gas, of producer gas, of illuminating gas and of every other fuel known to man. Directly or indirectly they are children of the sun, and it is the sun's energy that is given back by them to man. There are many different kinds of coal, varying from peat which is the first station on the way to the kingdom of coal, up to anthracite, which is almost pure carbon, having lost almost every other constituent. The value of coal is estimated principally by the number of heat units it can give off. Let us recall right here just what a heat unit is. A British thermal unit, abbreviated B. t. u., is the amount of heat required to raise a pound of water through one Fahrenheit degree. The table given herewith, compiled from the Practical Engineer, shows the relative heating values of the different coal fuels.

HEAT VALUE OF VARIOUS FUELS AND COMPOSITION

Name of Combustible	Composition				Caloric Power B.t.u.
	C	H	Volatile Matter	Ash	
Carbon	1.00	....	....	....	.....
Anthracite Coal	0.90	0.03	0.03	0.01	13500
Bituminous Coal	0.85	0.05	0.06	0.06	14400
Lignite	0.70	0.05	0.20	0.05	11700
Peat	0.55	0.05	0.30	0.10	9000
Peat 0.20 water	0.39	0.04	0.50	0.07	7200
Coke	0.85	0.05	....	0.10	12600
Peat-charcoal	0.82	....	....	0.18	9000
Dry wood	0.48	0.06	0.05	0.01	7200
Wood 0.20 water	0.40	0.05	0.25	0.01	5400
Wood-charcoal	0.80	....	0.04	0.07	10800
Hydrogen	....	1.00	....	....	62000
Carbonic oxide	0.43	....	0.57	....	4320
Illuminating gas	0.62	0.21	0.17	....	18000
Blast-furnace gas	0.06	0.02	0.92	....	1620

It will be observed from this table that the value in heat units of coal or other fuel depends practically upon its percentage of carbon. Anthracite has the largest percentage of carbon, but does not give off the greatest number of heat units, being a little behind bituminous coal in that respect; the gas from a blast furnace has the lowest quantity of carbon, and gives the least number of heat units.

The size of coal used in a furnace has a great deal to do with its efficiency as a heat producer, and manufacturers are giving this matter careful consideration. Coal known as "run of mine" varies from huge lumps down to slack and dust, commercially known as "culm." Lump coal averages 5 in. in diameter, and the other varieties known as "egg," "chestnut," "buckwheat," "barley," and so forth, indicate by their names their relative sizes. It has been learned by practical experimentation that with a chain grate stoker the work done by the coal increases with the size of coal up to a diameter of about ¼ in. and then decreases until the diameter is about 0.45 in., and then again increases. In fine coals there is a tendency to close up the draft holes, and thus perfect combustion is prevented and a large percentage of ash formed. The enormous quantity of fine dust necessarily produced in the mining of coal is sometimes made use of in the form of "briquettes." A suitable binding material, such as flour or pitch, is used to give coherence to the coal dust when compressed into bricks.

Pure hydrogen, of course, is not a carbon fuel, and the energy set free by the combination of this gas with oxygen, is similar to that obtained by the use of thermit, or in connection with the frightful heat of the electric furnace. Peat, as has been said, is half formed coal, and cannot rival coal as a fuel where coal may be readily obtained. In localities where peat is abundant, and coal is unavailable on account of the expense of transportation, peat is used with success as a fuel. It burns with a bluish flame when first ignited, and continues to do so until the grate bars and spaces are covered with glowing embers. The flame then changes to an intense yellow, and at this stage it sets free its greatest heat. Peat is an excellent producer of gas, and it is used widely for illuminating, heating and furnace purposes.

In Sweden it is used in the production of the famous Siemens-Martin steel, and also as the motive power in the operation of gas engines.

Wood, as a fuel, has about one-half the value of soft coal. A pound of coal is taken as the equivalent of 2.5 lb. of dry wood. A ton of bituminous coal equals about 2.12 cords of wood.

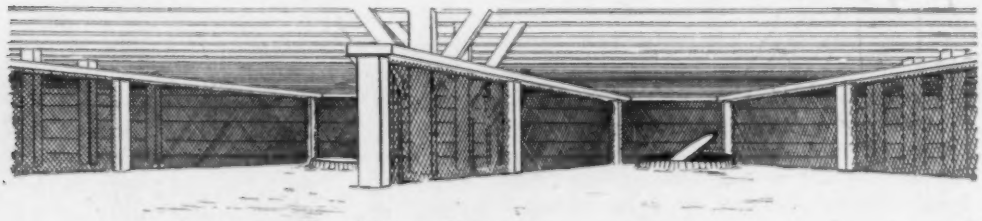
In the Southland, in the midst of the sugar industry, the refuse left after the sugar is extracted from the cane, is used as a fuel and is known as bagasse. Each ton of crushed cane will yield the equivalent of 120 lb. of coal. Owing to its presence as a by-product, bagasse is a cheap fuel and is largely used in the refining of sugar.

In certain favored portions of the United States, natural gas is available as a fuel. This gas was formed in the earth as the result of the chemical decomposition of carbonaceous matter. Its composition is mainly marsh gas, a compound made up of four parts of carbon and one of hydrogen. Fig. 3 shows the relative heating values of the various gases used as fuels. Water gas is produced by passing steam over red-hot coke or coal, and afterwards enriching it with benzine. Blast furnace gas is formed, as its name would indicate, from the chemical decomposition that takes place when pig iron is reduced from iron ore, and is used to a greater extent than formerly. It has high value as a fuel in connection with gas engines, when rid of the dust that is commonly associated with it. Oil gas is produced by the distillation of oil and other liquid hydrocarbons at a very high temperature.

Oil is an ideal fuel, as it has many advantages over all other forms. It has a high heat value and occupies a comparatively small bulk. It is easily stored and easily applied to the furnace. It is transported from well to distribution point by its own gravity. It gives a more equal distribution of heat in a furnace. It does not cake nor form clinkers and cinders. It is free from sulphur, thus adding to the life of boiler plates. It has greater steaming capacity than coal, and on the whole it is greatly to be preferred over all other forms of fuel. It is the crude petroleum that is used, just as it comes out of Mother Nature's laboratory, as the increase in cost of the refined product is greatly in excess of the increase in fuel value. It has been demonstrated that while a pound of anthracite coal will convert 9.7 lb. of water at the boiling point into steam, and a pound of bituminous coal will vaporize 10.14 lb. of water at the boiling point, a pound of fuel oil will transform 16.48 lb. of water at 212° F. into steam at the same temperature, thus illustrating in a practical way, the great fuel value of oil. It is quite probable that in the near future, oil will supplant coal on the larger, ocean-going steamships.

RIDDING SEATTLE OF RATS

Two miles of rat traps will be installed this summer under the docks of Seattle's waterfront by the municipal department of health and sanitation.



The Traps Which Extend Along Two Miles of Waterfront

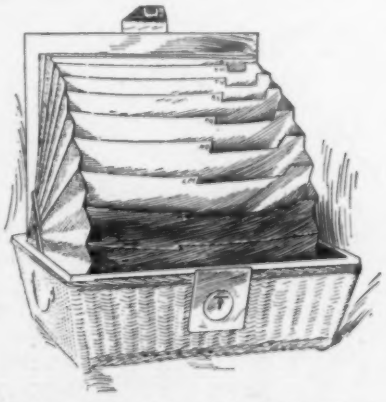
Since the discovery of a case of human plague in Seattle about three years ago the commissioner of health, Dr. J. F. Crichton, has co-operated with the government plague experts to drive rats from the city. So thoroughly has the work been done, that rats have disappeared from the business section. One district, however, that which includes the wooden docks and warehouses, still furnishes rat harborage.

Under the docks, Dr. Crichton plans to place 15 V-shaped corrals of wire netting. At the point of the V is placed a sunken barrel with a trap-door top, which tips as soon as the weight of the rat is on it, dumping the rodent into the pitfall.

The outer tips of these corrals will touch, making two solid miles of traps. The plan is considered more economical than the employment of the large force of city and bounty trappers, which has worked the district for the past two years.

WICKER FILE-BASKET

A file for private correspondence and accounts, which does not look out of place on a woman's desk and is yet highly serviceable, is here illustrated. The lower part is in the form of a basket, made of wicker, and the file

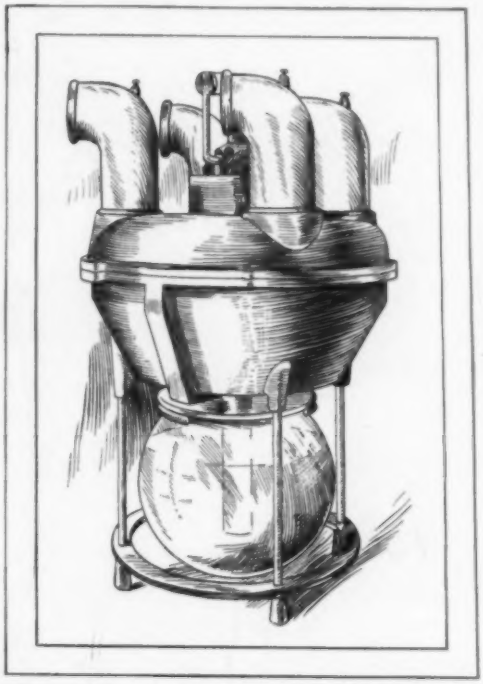


Desk File Especially Designed for Women

proper is of leather, attached to a wicker back, which forms the cover of the basket when pushed down and locked in place.

AIR PURIFYING APPARATUS

This air purifier is a new type of renovating apparatus, consisting of a



Cleans the Air by Bathing it in an Antiseptic Solution

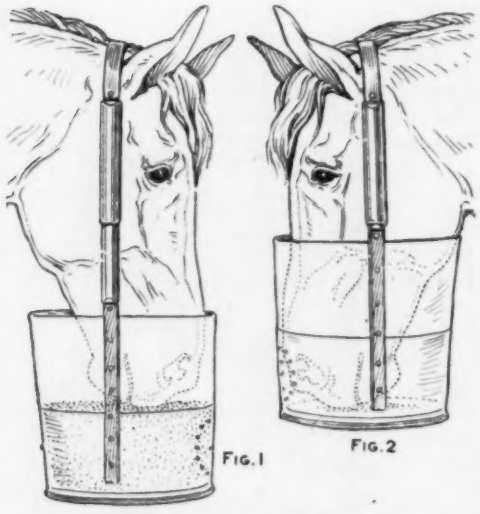
receptacle in which is placed an antiseptic solution. Through this solution the air of the room is drawn by means of a small, motor-driven exhauster, housed within the machine.

The antiseptic solution absorbs carbon monoxide, carbon dioxide, sulphurated hydrogen and other poisonous gases, and also retains all dust particles and bacteria that may be in the air drawn through it. The solution is prepared by dissolving specially prepared powders in water, and is said to give off oxygen in such quantities as to thoroughly revitalize the air of a large room, hall, railroad coach, and other like place in a very short time.

¶For the purpose of making a telephone booth really sound-proof, a German inventor lines it with tin. The method is said to be very successful.

TENSION STRAPS FOR FEED BAGS

The horse feeding from a common feed bag must toss his head to get all the grain. This causes considerable waste, as some of the grain is thrown out. An invention has been brought out and is being manufactured which adjusts the bag to the nose of the horse as the grain is eaten away. It consists of brass tubes, one of which telescopes in the other. An open coil spring is placed in such a way as to draw the tubes together. One of these devices is placed in the strap of the feed bag on each side of the horse's head. In the illustration Fig. 1 shows the horse starting to eat from his portion of feed and Fig. 2 shows how he completes his meal without having to toss his head. The tension of the springs is adjusted so as to keep the level of the grain against the horse's mouth at all times.



Adjusts the Bag to the Nose of the Horse

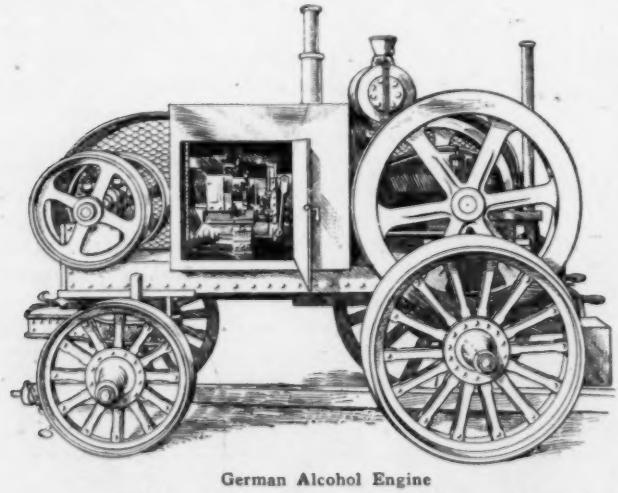
CREW OF ITALIAN CRUISER TAUGHT JU-JITSU

Ju-jitsu, the Japanese art of self-defense which became so popular as a fad in this country two or three years ago, is being taught to the crew of the Italian cruiser "Calabria." Just before leaving for Japanese waters the captain of the vessel received orders from the Italian king to let some of his men practice the physical exercises peculiar to Japan. When the ship arrived at Yokohama a teacher of ju-jitsu was procured and the men are now taking lessons.

ALCOHOL ENGINES ON GERMAN FARMS

A recent article in this magazine drew attention to the fact that the German government allows the farmer to manufacture alcohol for his own use at a low tax. This illustration shows an alcohol engine of the type used on many German farms for agricultural power purposes.

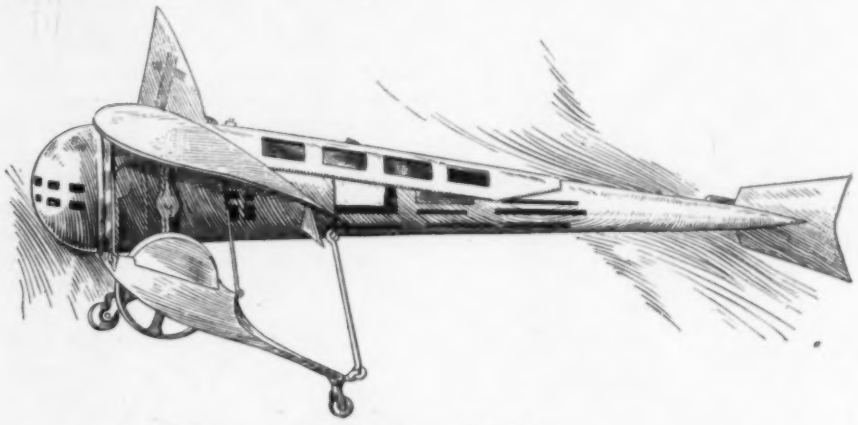
The engine is of the 4-cycle type, mounted on a truck. The valve mechanism and magneto are enclosed in a metal casing for protection against the weather. A countershaft is mounted on the front of the truck and belted to the flywheel of the engine, the power being transmitted to the thresher, pump, or other farm machines, by belting.



German Alcohol Engine

AEROPLANE DESIGNED TO CARRY PASSENGERS INSIDE

In this illustration is seen the model of a new English aeroplane containing many things not in common with the present accepted idea of such machines, one of the most interesting of which is the central torpedo-shaped body for the pilot, passengers, engine and stores. The openings in the head are designed as windows through which the passengers may look. The pilot's seat is just back of the wing-like planes. He is provided with a slightly raised and open section through which he may look out over the machine.



Proposed Type of Aeroplane

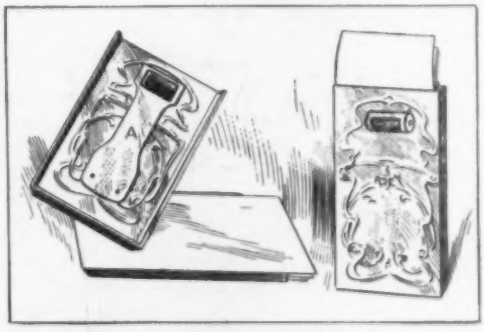
The most important scientific feature of the machine, however, is the means by which the inventor expects to secure automatic stability. The planes or wings are mounted on a ball-bearing collar, which is fixed on the central body, and, if not held in control by the mechanism provided, will oscillate freely on this collar without imparting their motion to the central body. A gust of wind tilting the planes at one side does not heel the central body over, as in the case of machines where wings and body are joined rigidly together.

By an ingenious automatic arrangement, the oscillations of the wings are limited and checked, and this device always tends to keep them horizontal, and so to maintain lateral stability. In other machines this is done by hand-controlled devices.

The ideas evolved in this machine are, of course, still only ideas, as the machine has not yet been tried out.

IMPROVED CIGARETTE PAPER HOLDER

With the ordinary cigarette paper pack, it is often difficult to separate the thin leaves so as to get only one, even though they are blown upon and the finger moistened. To remove this difficulty, a French inventor has devised a holder provided with a piece of rubber in the form of a rowel, which engages with the top leaf in the holder and pushes it out, without disturbing the others.



Holder Provided with Leaf Extractor

SIMPLE OVEN FOR GAS STOVES

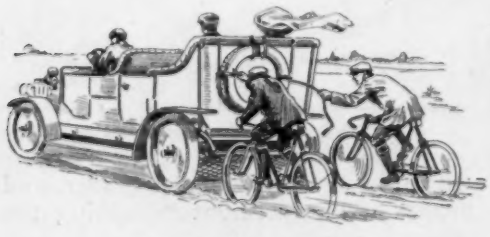
An oven that sets over the burner of a gas or gasoline stove and will bake

Hooded Oven for Gas Stoves

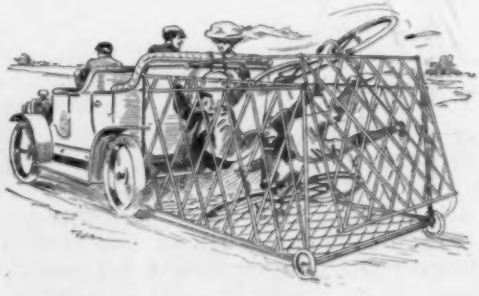
biscuits, pies, cakes, apples, potatoes, cook vegetables, and roast meats, is here illustrated. It consists of a heating plate of the kind used for heating irons, a stand to support whatever is being cooked, and a drum-shaped hood that sets over the whole.

SUGGESTION TO TRAP TIRE STEALERS

The stealing of spare automobile tires at night by thieves on bicycles, in the manner shown in the first illustration, has resulted in this suggestion, more or less humorous, for trapping the miscreants. The cutting of the straps and removal of the tires automatically throws into action a device which drops the cage trap, with the result shown.



The Tire Stealer at Work



His Tragic Finish

ELECTRO-MAGNETS TO TREAT NERVOUS DISEASES.

A method of electric treatment, just opposite to that now ordinarily in practice, is being utilized by a physician of Zurich, Switzerland, for treating the nervous system. In the usual electric treatment the current itself traverses the body of the patient, while in this method the magnetic fields, or the region outside the circuit, are brought into play. That is, the apparatus works upon the body in the same way that an electric magnet grasps iron, although, of course, the body is not drawn to the magnet, as is the iron.

The electrician who developed the magnet treatment is said to have conceived his idea in 1883, when engaged in directing the electrical installation work at the St. Gothard fortifications. He happened to observe rather strange effects on the organisms of the men working in intense mechanical fields of alternate polarity, as produced by alternate currents. These men seemed generally to enjoy better health than their comrades employed in other places at similar work. Experiments made later, brought out the fact that persons suffering from nervous diseases, especially those affected with facial neuralgia and insomnia, would feel considerable alleviation of their trouble

after staying some time in the neighborhood of electro-magnetic apparatus.

The electro-magnetic field used in the treatment is generated by an alternating current thrown, at 50 cycles per second, through a coil surrounding an iron core. The fact that a violent glow is perceived on placing the magnet near the temples, ascribed to a stimulation of the optical center, demonstrates the possibility of influencing the center of the nervous system through the bones of the skull.

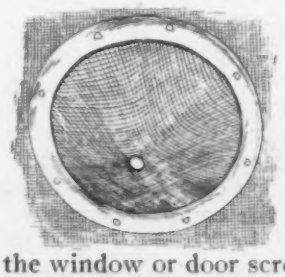
LIGHT AS A BURGLAR EXPELLER

Some time ago one of the engineers of Chicago's largest electric lighting company, devised a system of emergency lighting for residences, by which the turning of a master switch at the head of the bed turns on the lights all over the house. These lights may be ordinarily operated by their respective switches in the usual way, but in case the master switch is turned on, they cannot be turned off by means of the individual switches. This means, of course, that once the master switch has been thrown, any intruder in the house must beat a retreat.

The system is now being used in many Chicago homes.

FLY ESCAPE FOR SCREENS

A device that lets flies out through a screen without letting them in, is here illustrated. It is funnel-shaped, with a hole at the end through which the flies, attracted to the screen by the sunshine, may make their escape. It is attached to the window or door screen by means of a metal ring, after which the part of the screen over which it sets is cut away.



LONG-HANDLED CONCRETE SIDEWALK TROWEL

A long-handled, double-action cement trowel has been designed to take

The New Idea in Concrete Trowels

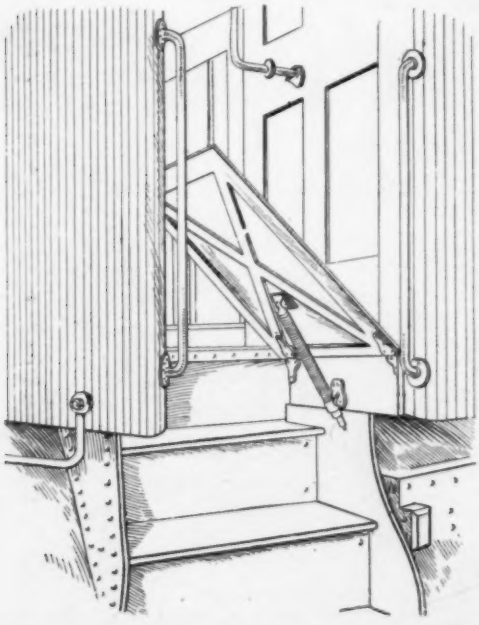
the place in concrete sidewalk construction of the ordinary hand trowel, thus providing an implement by which surfaces can be finished without the necessity of stooping over.

The new trowel smoothes the surface both ways, working with a push and pull movement. As the operator moves it back and forth, the edges are automatically raised to prevent its digging into the mortar.

A typewriter was the means by which a deaf witness was interrogated in a New York court recently. The questions were typewritten by a stenographer seated by the side of the lawyers, and read and answered by the witness. A few days later a phonograph was utilized in making records of testimony before the Federal grand jury in that city.

SAFETY TRAP-DOOR FOR TRAIN VESTIBULES

This vestibule trap-door for passenger coaches is of the automatic variety,



Spring Keeps Trap-Door from Swinging into Vertical Position

swinging upward when the lock holding it is released. It has, however, a safety device, in the form of a spring, which is so adjusted that it only rises to an angle of 45° when the lock is released. It thus prevents passengers from falling, if, through any cause, the lock is released. It is necessary for the porter to lift the trap-door from the angle of 45° to a vertical position before the vestibule door may be opened.

PHOTOGRAPHIC REPRODUCTION OF SOUND

The U. S. Consul-General at Stockholm reports a remarkable combination phonograph and kinematograph by which photographs are made to reproduce sound as well as views. The possibility of producing the two at one time is in itself remarkable, but that photographic reproductions can be made to "talk" is the great feature.

The making of the records is explained as follows by Consul-General E. D. Winslow: "No receiver is needed for the speaker; only a small celluloid tube, which may be dispensed with if desired. On one side behind a wall is placed an electric lamp. From this the light passes through two cuvettes (a cuvette is a pot, bucket, or basin in which molten plate glass is carried from the melting-pots) through which water is running. This water absorbs the heat, and then the light passes through a system of lenses in front of a tube. Having passed through these, the ray of light strikes and is reflected in a mirror fastened on a membrane behind the tube, is thrown onto a rotating sensitive plate, and finally draws the sound curve on this negative. This original negative is developed, and the sound curve transferred to plates of ebony. From these the sound is produced as in the gramophone, but without any disturbing secondary sounds.

"So perfect is the reproduction of sounds with the photographone that the inventor can distinguish between and actually read on the curve the different letters of the alphabet, and the photographic plate is so sensitive that the smallest variations in the voice can be studied. The records may be reproduced in great numbers, and the volume of sound may be regulated so as to fill a large concert hall."

PRIVATE IRRIGATION WITHIN SALT RIVER PROJECT

The reclamation system of a private concern will be incorporated within the Salt River irrigation project in Arizona. The Secretary of the Interior has approved a plan for a contract with the company. This canal system irrigates about 24,000 acres and its water right from Salt River was one of the earliest.

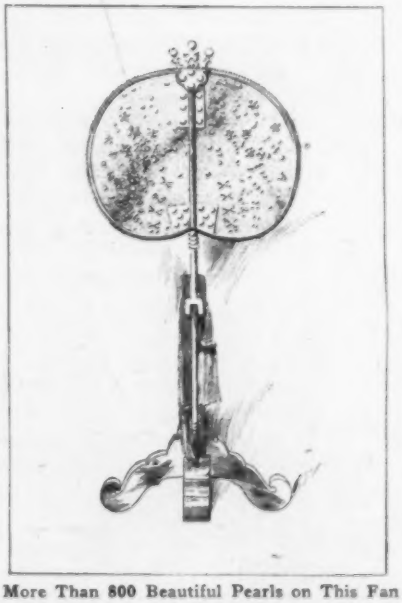
The value of the company's system is estimated to be $6,157,000. The owners of 17,000 acres under the system have expressed their willingness to join the Salt River Valley Water Users' Association and make their lands a part

of the project, and it is understood that the remainder are willing to join, under certain conditions. There are about 100 shares of stock and it is intended to allow the owners to receive credit on account of the value of the stock, as against the amounts due on their applications for water right for their lands. For those who do not join the Water Users' Association, it is proposed to make an appropriate charge for the carriage of the water supply to which they are entitled.

JAPANESE WAR FAN

This curiously shaped fan is an exact reproduction of the "Gumbai Sen" (War Fan), known as one of the priceless treasures in the Japanese Imperial House. The famous fan was taken to Japan from Korea some 300 years ago by one of the most noted of Japanese heroes.

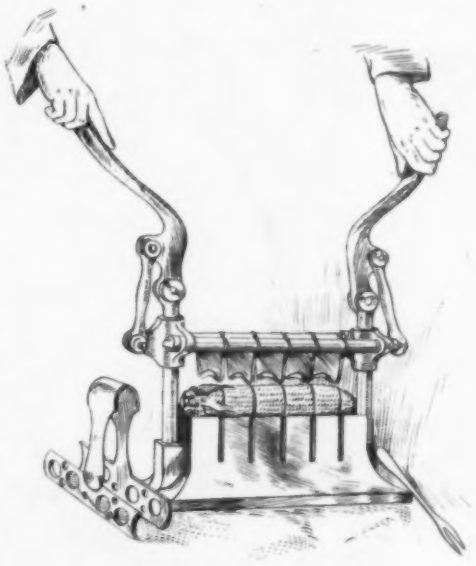
The reproduction here shown was made after several years spent in searching for pearls of exquisite shape and luster. The fan proper is 11 in. by 20 in. in size, embroidered with gold threads and beaded with 805 beautiful pearls. The handle is of pure gold.



More Than 800 Beautiful Pearls on This Fan

CUTTER AIDS CORN EATERS

This cutting device, designed for use on the dining table, cuts a cob of green corn into several pieces of convenient size for easy handling. The cob is placed in the trough-like holder and the five knives set above it are pushed downward by means of the handles at each side. The complete service consists of the nickel-plated cutter, and specially constructed tongs and forks for handling the sections of cob.



Cutter for Corn on the Ear

GOLD FISH AS MOSQUITO EXTERMINATORS

Two varieties of gold fish are to be introduced into the lakes and ponds of Massachusetts, as important factors in a mosquito extermination campaign. There are two varieties of gold fish, the "Heterandria Formosa," and the "Gumbusia Holbrokii," found in North Carolina and Cuba, which easily become acclimated in the northern states and whose entire food is preferably mosquito larvae. The best way to stop the mosquito pest, according to Dr. Samuel Garman, of Harvard, is to send an army of gold fish against them.

BEAVERS GOOD MECHANICS

The gnawing of this tree trunk by beavers in the Zoological Garden at Regent's Park, London, is a demonstration of their sharp instinctive or, perhaps, reasoning powers. These animal wood-cutters fell trees for the material required to build the dams of their half submerged mounds. In so doing, they select one that is near the water, so that when it is gnawed through sufficiently to allow the wind to blow it down, the likelihood is that it will fall into the water, where it is required.

Tree Trunk Gnawed by Beaver

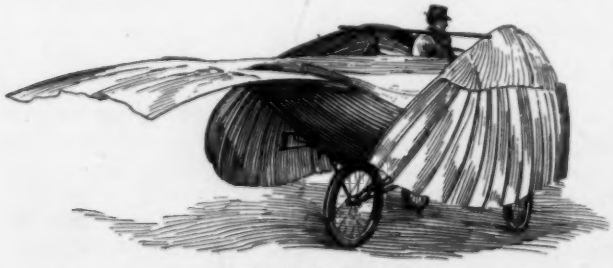
Each year the management of the Zoo plants a new trunk for the beavers to work upon. When the accompanying illustration was made, the trunk had been gnawed through to such an extent that it would sway in the wind, filling the spectators with wonder that it did not topple over. When gnawed just so far, the beavers left it for a more strenuous wind than usual to complete the task, which action on the part of human beings would be considered a wise precaution against possible accident.

FAMOUS SCOTCH BRIDGE RESTORED

"The Auld Brig of Ayr," the bridge in Scotland made immortal by the poet, Robert Burns, has been completely restored, although the work of strengthening it was quite complicated. Concrete was the material used. The bridge has four spans of slightly more than 50-ft. length, and is 12 ft. wide between parapets. The piers formerly rested on 12 by 8-in. oak beams placed on firm boulder clay. Some idea of the age of the bridge is afforded by the fact that one of the spans was considered "new" because rebuilt only 200 years ago.

CURIOUS TRICYCLE-AEROPLANE

This curious aeroplane is intended for operation both on the road and in the air, and comes under the "freak" class of aerial machines, countless numbers of which have been tried and found wanting. A propeller is not to be used for air work, or any ordinary motorcycle-drive for road work. Instead, the inventor expects the beating of the wings, power for which is supplied by a 6-hp. engine, to constitute the means of motion, both on land and in air.



Freak Tricycle-Aeroplane

In its character of a motor-tricycle, the machine requires a license and number plates, which probably makes it the first flying-machine to comply with such regulations.

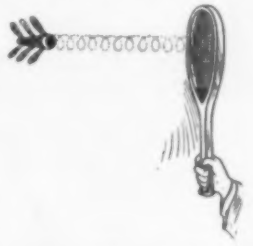
HORSE SPECTACLES RESULT IN HIGH STEPPING

One well-known firm of English opticians, according to a London newspaper, makes a specialty of the manufacture of horse spectacles, the object of which is to develop high-steppers. The glasses used are deeply concave and large in size, set in leather rims that entirely close out sight except through the lens, insuring the attainment of the desired result.

A horse wearing the spectacles gets the idea that the ground just before him is raised, and consequently he steps high. The spectacles are generally used when the horse is young, and the effect upon his step and action is said to be remarkable.

THE FLYING ZEPHYR, A NEW FRENCH GAME

"Le Volant Zephir" (The Flying Zephyr) is the name given this little amusement ball in France. It was inspired by the progress of aviation, and its feathers are arranged in the form of wings. When struck with a racket, it sails through the air with a little of the rising and falling motion of an aeroplane. The game, of course, is to keep the winged ball flying between two players.

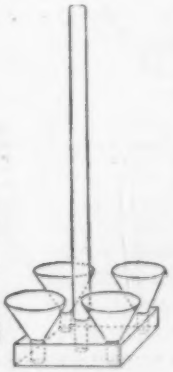


SPACING DEVICE FOR PLANTING CORN

The ordinary method of planting corn in the United States is by machines which deposit the kernels together in a small space. This, according to the Department of Agriculture experts, results in the stunting of many plants because of insufficient space to form strong roots. Just such a state of affairs is shown in the illustration in which one of the stalks is large and the other three stunted.

Perfect Hill of Corn Made Possible by Spacing Machine

Hill of Corn Planted by Ordinary Planter



The Spacing Machine

The root system of a corn plant requires a cubic foot of space for foothold, and to provide this, one of the experts of the Bureau of Plant Industry has devised the accompanying spacing tool. By its use, two kernels are planted at each corner of a 5-in. square. In the government tests all the rows were thinned when a foot tall to a uniform stand

of four stalks to the hill, and each hill presented the appearance shown as "a perfect hill" in the illustrations.

The government tests prove that such spacing increases the value of the crop 5 per cent, which means that if this type of spacing machine were to be used universally, the annual crop in the United States would be increased 50,000,000 bushels.

DEVICE FOR LOCATING AUTO TROUBLES

The time to locate engine trouble is before the clicking sound that means something is wrong develops into a

This Device Accentuates the Click

knocking, but this infancy of the knock is usually such as to be difficult to locate. With this device, however, the clicking sound is accentuated until it resembles the noise made by a trip hammer. The transmitting tube is placed against the part of the mechanism where the trouble is believed to be, and the sounding-box is placed against the ear.

WEIGHTS SADDLE HORSES SHOULD CARRY

During the Paris horse show of this year, an expert jury set themselves the task of determining just how much weight saddle horses of different sizes should carry, so that a fairly definite rule of guidance would be in existence, as an aid in classification.

Conformation of back and size of cannon bore being satisfactory, the jury rendered the decision that, a horse weighing not over 825 lb., with girth 67 in., should not carry more than 187 lb.; a horse weighing not more than 935 lb., with girth of 69 in., not more than 209 lb., and a horse weighing at least 1,045 lb., with a girth of 71 in., not more than 231 lb.

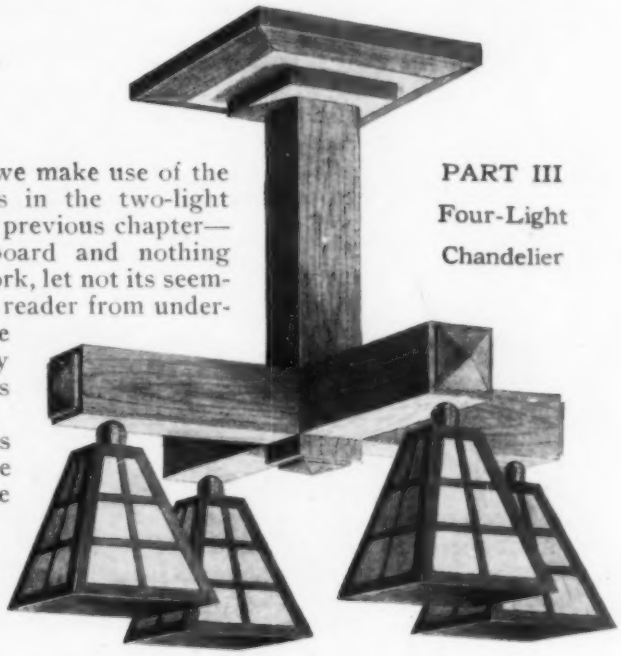
COMBINED FIREPLACE AND COOKER

An ingenious combination of fireplace and cooking stove has been evolved in Australia for cottage homes and other dwellings in which the kitchen is used as a living room. Various styles are made, the most simple having a solid firebrick grate and an oven, heated by coal or wood fuel only. A more elaborate design is made for either coal or gas cooking. Nearly all the designs have a recess over the oven, which may be closed with a sliding door and used as a warmer.

Ingenious Australian Stove and Fireplace

THE MAKING OF ARTS-CRAFTS LAMPS

By JOHN D. ADAMS



PART III
Four-Light
Chandelier

IN this mission chandelier we make use of the same design of shade as in the two-light portable lamp described in a previous chapter—shades of paper and cardboard and nothing more; and as for the wood work, let not its seeming massiveness frighten the reader from undertaking its construction, for the timbers are not solid—they are all built up of light boards nailed together.

When the woodwork is stained to match that of the room, and the shades are painted a dull black around the framework and lined with an appropriate color of paper, the effect is very attractive, even in daylight, which is often more than can be said of colored glass shades. If a warm green tone of paper is used, when illuminated, the upper portion will appear almost an orange, which will gradually taper off into the true green at the bottom of the shade. After ordinary green tissue paper is used for some time this effect becomes more pronounced, due to some effect that the greater heat of the upper portion has on the paper.

The method of making this form of shade having been already described, nothing more need be said in this regard except to suggest that the same outside dimensions may be retained while the simple cross bars may be replaced with any simple design or pattern required. Occasionally a simple monogram is capable of being concealed in an artistic manner, or else the main motif of the stenciling used on the walls or frieze may be used as a model.

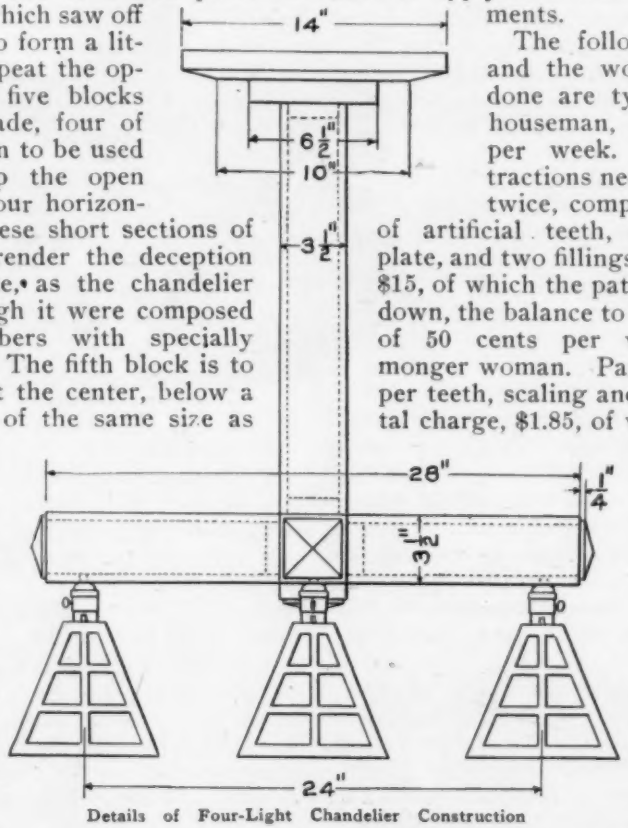
The woodwork should start with the ceiling plate, which is simply a square piece with beveled edges, upon which is fastened a square block. Procure from the mill two or three lengths of ½-in. dressed lumber. From the height of the ceiling, determine the necessary length of the center post, and then simply make a long narrow box, or rather square tube, 3½ in. to the side, of this length. Then make another one, 28 in. long, so as to form two of the horizontal arms in one piece. Two shorter sections must then be made for the two remaining arms. It is absolutely imperative that all the ends of these wooden tubes be perfectly square, which will necessitate a liberal use of the steel try-square.

Next prepare four square blocks, 1 in. thick, of such a size as will exactly fit into the ends of the wooden tubes—that is about 2½ in. Nail and glue one to the center of the ceiling plate. The remaining three are to be attached to the long horizontal section at its middle point and on three of its sides. The object of these blocks will now be apparent. Slip each of the short horizontal sections over a block and make it fast—this forms the horizontal cross.

Now set the center post on the third block and make it fast.

Finally, set the ceiling plate bottom side up on the bench, and then slip the upper end of the center post over the small block and secure it firmly. This completes the assembling of the larger pieces. At all joints use glue and wire nails, the heads of which should be deeply set and puttied over. Procure a short piece of 3 by 3-in. stuff, and work up one end to a dull point as shown, after which saw off a slice so as to form a little block. Repeat the operation until five blocks have been made, four of which are then to be used in closing up the open ends of the four horizontal arms. These short sections of "end" wood render the deception quite complete, as the chandelier looks as though it were composed of solid timbers with specially shaped ends. The fifth block is to be attached at the center, below a second block of the same size as the main timbers.

On account of the hollow nature of the structure, the wiring will be found a very simple matter, provided it is attended to before the end blocks are nailed in position permanently.



Details of Four-Light Chandelier Construction

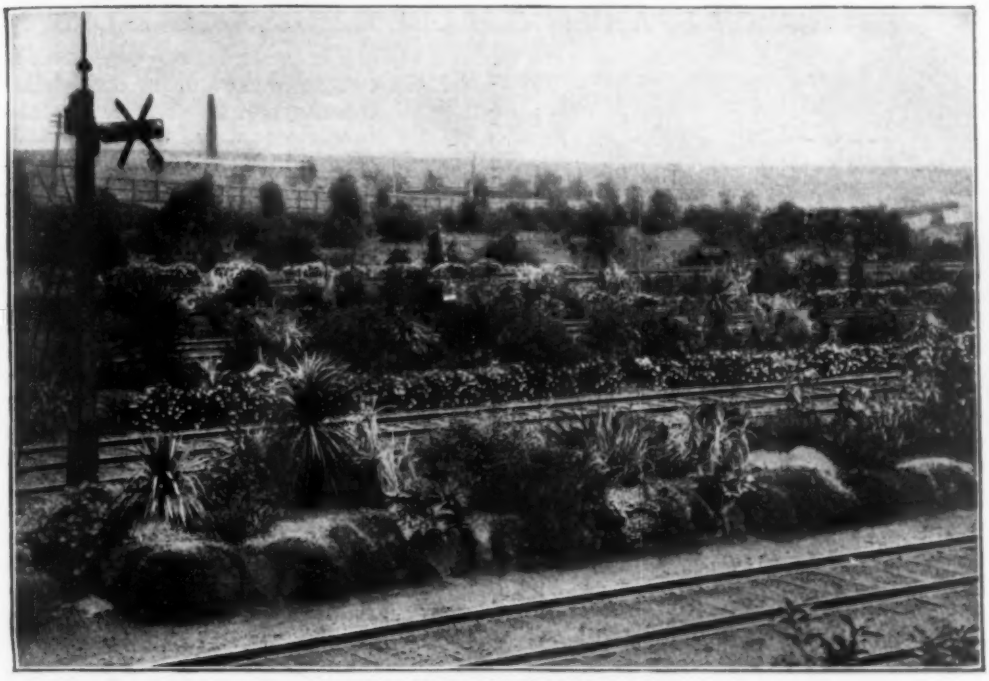
COST-PRICE DENTISTRY GOOD PHILANTHROPY

A dental surgery was recently founded in London to determine whether $1,000,000 offered by an anonymous philanthropist for establishing cost-price dental parlors should or should not be accepted. Realization of the great amount of ill health caused by neglect of the teeth, and that such neglect is almost universal among the poorer classes because of the excessive cost, were the causes which led to the offer.

That it will benefit the class of people for whom it was conceived was undoubted soon after the experimental parlor was opened. The rush to have work done is so strenuous that patients have to apply in advance for appointments.

The following patients and the work they have done are typical: Warehouseman, wages $4.50 per week. Several extractions necessitating gas twice, complete upper set of artificial teeth, partial lower plate, and two fillings; total charge, $15, of which the patient paid $2.50 down, the balance to be paid at rate of 50 cents per week. Costermonger woman. Partial set of upper teeth, scaling and cleaning; total charge, $1.85, of which 35 cents was paid down, and balance must be paid at rate of 25 cents per week. Girl clerk. Two teeth extracted and stumps drawn, six artificial teeth; total charge, $3.75, of which $1.75 was paid down, balance 25 cents per week. School teacher. Teeth scaled and cleaned; charge, 25 cents.

¶The Department of Agriculture is using ten tons of tree seed in planting trees of the national forests this year. If every seed produced a young tree, the result would be a supply of nursery stock sufficient to plant 300,000 acres.



Beautified Railway Tracks in Australia

BEAUTIFYING THE AUSTRALIAN RAILWAYS

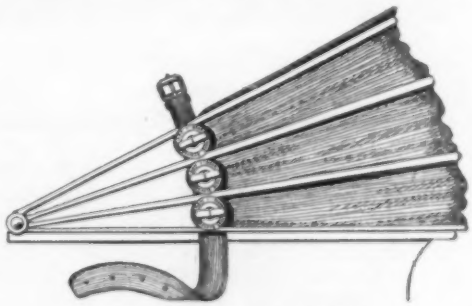
Many miles of the track of the Victorian railways of Australia have been converted from desert-like stretches into beautiful gardens.

A nursery has been established by the railroad and 100,000 plants are about ready for setting out. More than 8,000 gum plants were sent to one roadmaster last year, and 80 per cent of them were successfully planted.

PROTECTORS FOR AUTO HOODS

The life of automobile hoods is greatly prolonged by the adoption of this device, which is called an "insulator" in France. It consists of a strap on which three rubber cylinders or buttons are adjustably mounted. These rubber separators are set between the rounds of the cover and hold them apart, so that they cannot strike against and damage each other, no matter how constant the vibration due to running over rough roads. They also keep the top slightly extended so that the air can readily circulate through and dry it, thus preventing rotting by dampness.

After the rubber separators are

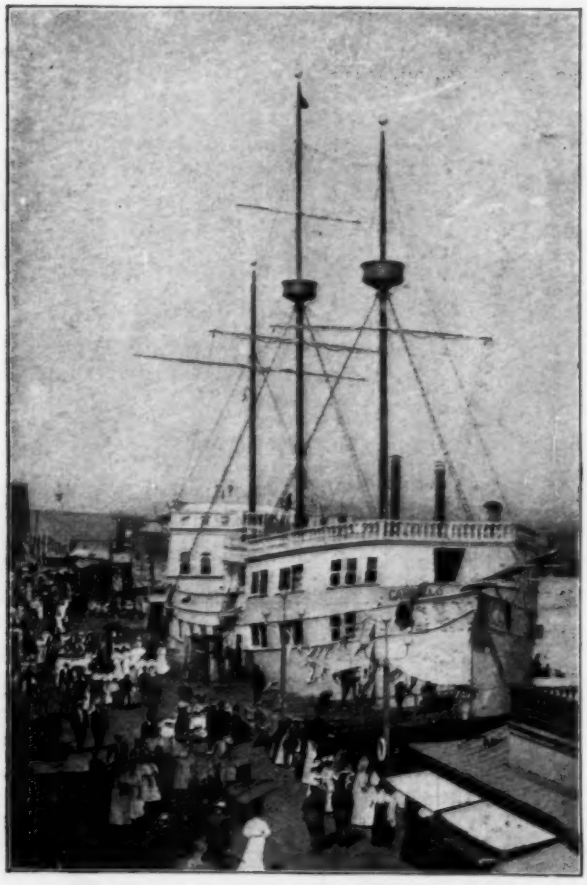


Protective Device in Position

placed in position as shown in the illustration, the end of the strap is passed through the buckle and drawn tight.

¶The annual consumption of ice in the United States is estimated to be 37,000,000 tons, of which 22,000,000 tons is natural ice.

REPLICA OF SPANISH GALLEON BUILT ON PILES



A Ship That Has Never Sailed

One of the unique seaside attractions of the Southern California coast is the ship café "Cabrillo," at Venice of America, the beach resort of Los Angeles. This ship that never ploughs the main was built after the models of the Spanish galleons of old and was named in honor of Cabrillo, the first white man who ever sailed a craft along the California shores. The "Cabrillo" is built on piling and is permanently anchored over the breakers, alongside the pleasure pier. Throughout, it is fitted and furnished after the fashion of an ocean steamship, with bells to note the passing of the ship's watches and on state occasions with uniformed Spanish officers in command. The cost of the ship was $65,000.

"STINGAREE" KILLS SWIMMER

Death in a most unusual form was inflicted upon Laurence Baker, an 11-year-old boy, while diving from a boat near West Palm Beach, Florida. A stingaree, frightened by the plunge, whirled about and struck him with its barbed spines. The stingaree, or sting ray, has one or more large barbed dorsal spines on a whip-like tail.

¶A New York department store is installing a wireless outfit so that passengers on incoming liners may do their shopping by wireless.

AUTOS SPREAD GYPSY-MOTH PLAGUE

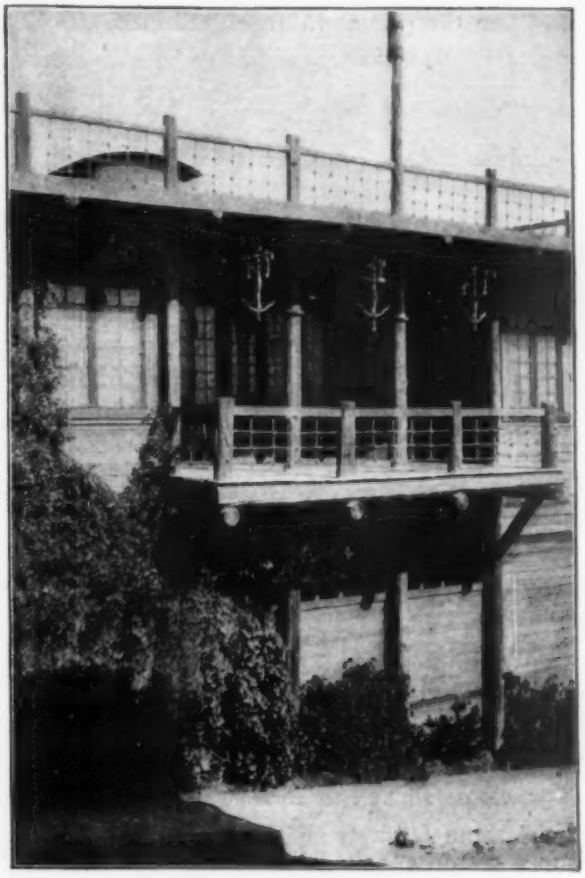
Owing to the fact that the female gypsy moth cannot fly, this insect curse has been more or less successfully confined to the state of Massachusetts, but, curiously enough, the automobile is becoming a serious factor to be dealt with in connection with the problem. The caterpillar of the gypsy moth attaches itself to automobiles whenever the opportunity offers, and then drops off to spin its cocoon at a distance of perhaps several hundred miles from its starting place.

The moth-fighting organization of Massachusetts is striving to clear away all trees and underbrush for a distance of 100 ft. on both sides of the main roads of the state in an endeavor to prevent the pests from availing themselves of this kind of transportation. Other vehicles of all kinds also spread them.

ANCHORS FOR CHANDELIERS IN CLUBHOUSE

A seaside clubhouse at Long Beach, California, has made use of nautical decorations throughout, and the most noteworthy success in novel decorations is the adaptation of anchors for chandeliers. They are suspended on chains about the rustic balconies and are hung with electric bulbs, whose wires are interwoven with the anchor chains, and, when the building was new, each of these bulbs was screened by a very characteristic lamp shade, the large round shell of the sea-urchin. Only a couple of these shells remain,—one may be seen on the anchor in the center —as they are rather brittle.

The clubhouse itself is built in a rustic style and the use of a network of cords in a balustrade carries out the general marine effect.



Appropriate for a Yachting Club

GARDEN FURNITURE MADE OF OLD WAR-SHIPS

One of the profitable uses to which the English shipwrecking concerns adapt the teak and other woods of old wooden warships, sold to them for breaking up, is garden furniture, such as chairs, settees, etc. One concern is making such chairs of man-o'-war teak. No paint or varnish is used upon them, the natural finish being much more artistic and far superior to such treatment.

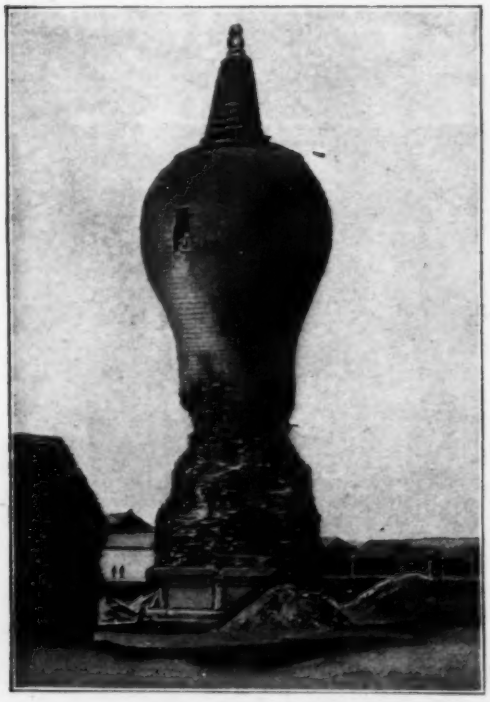
THE NORWAY SEA-FISH HATCHERIES

Figures, taken from the fishery statistics of Norway, show the wonderful results obtained by the cod hatcheries, the operation of which commenced several years ago. The statistics from the Kristainiafjord, inside of Droebak, began in 1872, show an average catch of 75,761 cod in the period between 1872 and 1881, and of 58,476 between 1882 and 1891. In 1892, when cod fry first were planted, the catch was 44,013. Since then there has been a steady increase, and last year the catch was 114,013.

The number of fry, planted in the Kristianiafjord since 1892, is about 170,000,000 valued at about $2,000, while the increase in the catch over and above what it was in 1892, is worth about $225,000. On the west coast of Norway, where hatching has not been conducted, the cod is gradually disappearing from the fjords.

CHINESE DEPOSITORY FOR HUMAN BONES

When the graves in an old Chinese cemetery were opened up in order to



Chinese Sepulchre for Human Bones

make room for a fresh burial, the old bones were deposited in sepulchres of the kind shown in this illustration. The crumbled foundation seen on the left once bore a sepulchre of the same kind, also.

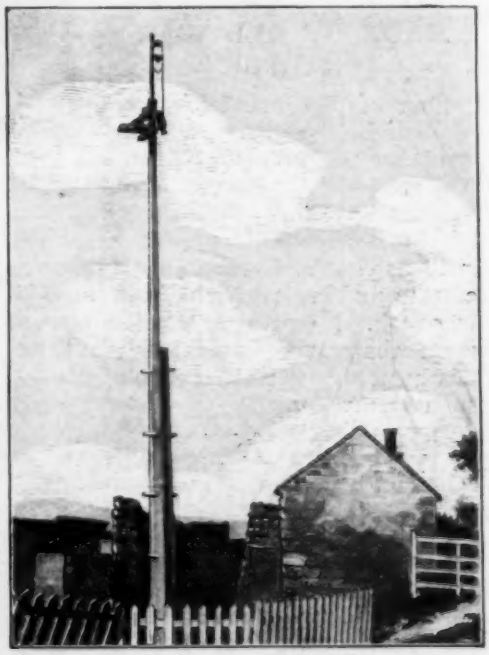
THE WIRELESS PHENOMENON OF DAY AND NIGHT

Several reasons have been put forward to account for the fact that a wireless station works better by night than by day, but none of the scientists seem to know the answer. Marconi at first attributed it to some influence exerted by the sun's light on the antennae, but now believes that the upper air, which is always very rich in ions produced by the ultraviolet solar rays, absorbs the energy emitted by the wireless stations during the day.

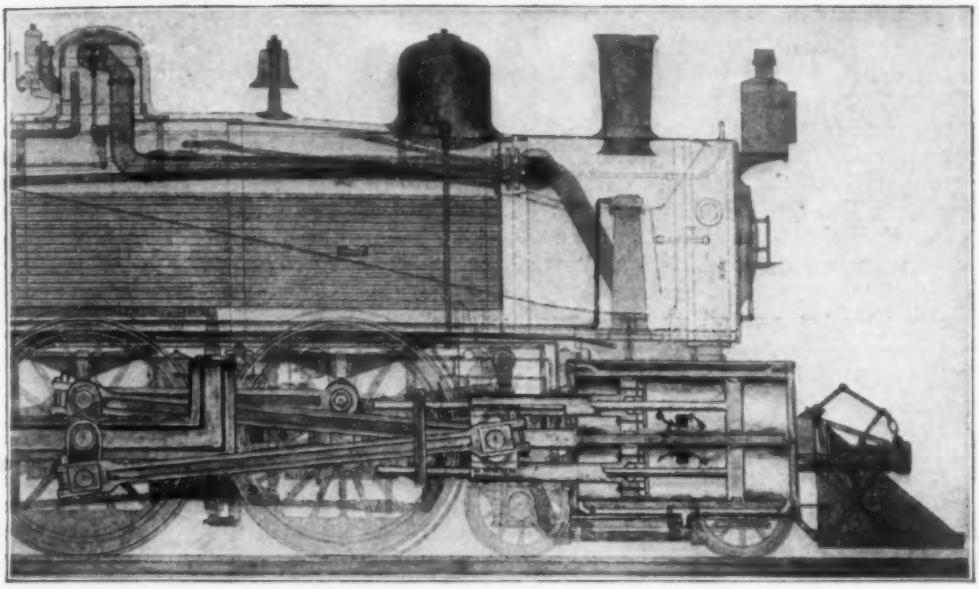
The effect seems to be rather complex, however, and depends upon the wave-lengths of the Hertzian radiations. By using radiations of great wave-length, about five miles, Marconi has been able to show that the energy during the day may exceed that at night, which is just the opposite of what usually occurs. The long waves lengthen the radius of wireless operation during the middle of the day, yet at other times, notably sunrise and sunset, the waves of small length are preferable.

FLYING SHOES FOR GOOD LUCK

If shoes must be used at a wedding, it might be well to follow the practice in some of the country districts of England. Instead of hurling old boots, shoes and slippers at the couple, friends take one shoe belonging to the bride and one of the groom's, and nail them at the top of a flagpole. This is supposed to bring good luck. At any rate, the shoes can inflict no injury when used in this way.



One Way of Utilizing Old Shoes at a Wedding



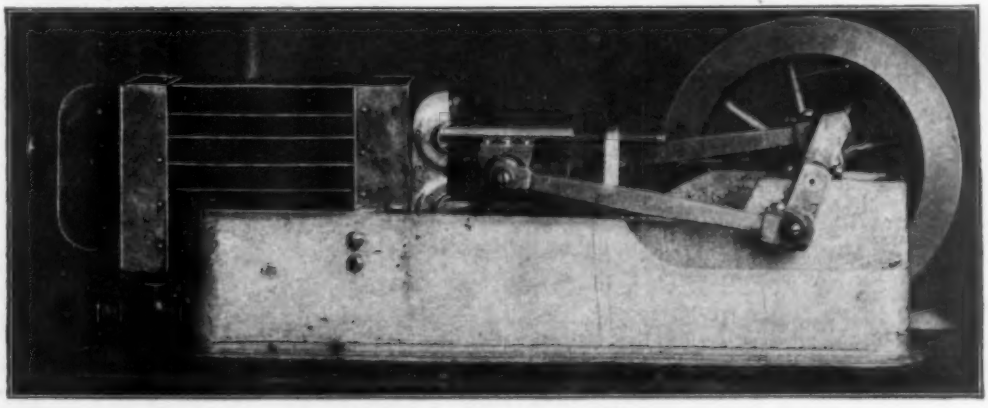
Showing Operation of Engine for Locomotive Use

HEADLESS TWIN-CYLINDER ENGINE

Much interest has been shown in the mechanical world in the headless twin-cylinder engine invented by two New Orleans men. The most radical feature of the engine is that the cylinder heads, instead of being closed and made strong enough to resist great pressure, as is the case with engines of the ordinary type, are open. Features of merit claimed are reduction of fuel with an increase in power and withal an almost entire elimination of vibration.

The engine was tested recently at the plant of the New Orleans Sewerage and Water System.

The steam is introduced between two pistons reciprocating in headless cylinders, utilizing the power lost on the heads of ordinary cylinders. The drawing illustrates the solid piston rod passing through the front or tubular piston rod. It represents twin cylinders, one above the other. The solid piston rod of one is connected with the tubular

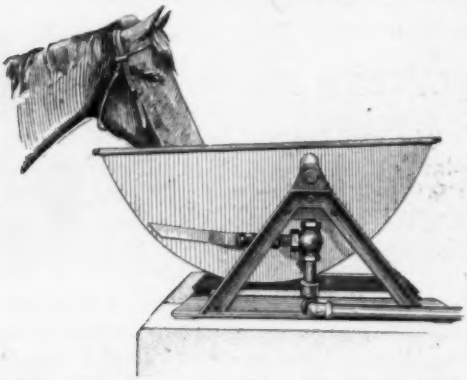


Model of Headless Cylinder Engine

piston rod of the other by means of two crossheads, which are allowed to pass each other, by the tubular rods being slotted. When the pistons in the upper cylinder reach the end of their outward stroke, the pistons of the lower cylinder reach the ends of their inward stroke. The crossheads are connected with the shaft by two main arms. When one main arm is forced forward the other is pulled backward. The steam chest is located on the side between the two cylinders. The steam is admitted to the interior of the cylinders by means of ports, at or near the middle thereof. A slide valve alternately connects the ports with an exhaust and the steam is exhausted from each cylinder alternately. The open ends of the cylinders are closed by suitable doors, shown in the illustration, to exclude dust and other extraneous matter from the interior of the cylinders.

AN AUTOMATIC HORSE AND CATTLE TROUGH

A horse and cattle trough, which automatically provides the horse or the cow with a drink of fresh water any time of the day or night, has been invented by a mechanic of Salt Lake City. The device is so arranged that, when the animal begins to drink from the receptacle, a fresh supply of water is automatically turned in and is shut off when the animal gets through drinking. The trough can be of any size, and can be made to water any number of cattle or horses.



Trough Which Provides Every Horse with Fresh Water

The holder or trough is semi-circular in shape, and is placed on a pivot at a point a couple of inches from the center. When the trough is empty the top is level, the equilibrium being maintained by the weight of the smaller side of the trough and the force of a spring plunger, which regulates the water supply. As the tank is filled with water the equilibrium is shifted to the longer side, and as it becomes filled, the water supply is entirely cut off by the weight of the tank forcing the plunger inward in the supply pipe. As the animal begins to drink the weight is lessened, and the water starts to flow again. The arrangement can be regulated to make the animal drink slowly, or the supply of water for the animal can be limited or entirely cut off.

THE DWARFING OF AMERICAN MARINE

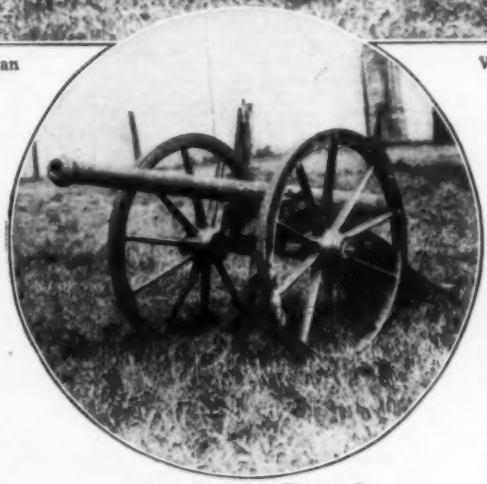
The disappearance of the American merchant flag on the high seas cannot be more graphically recounted than in U. S. Consul Du Bois' terse statement of what had befallen American marine in Far Eastern waters.

"In 1856 there were 1,047 ships, including native craft, entered at Singapore," says the consul, "and of them, 45 were good-sized American merchantman. Four years ago the American ship "Acme" called at Singapore in ballast for repairs; three years ago the "Ivy" called with a cargo of salt and cleared with lumber; two years ago the foreign built American ship "Hanamet" arrived, and last year the barkentine "Jos. L. Eviston" called in ballast and was sold. The total number of vessels entered at Singapore in 1908 was 29,234, of which only one small craft flew the American flag."

British and Roman War Chariots

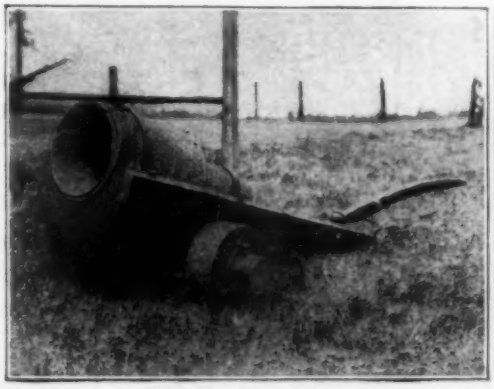
RELICS OF OLD WARS

Among the exhibits shown during the British army pageant held in Fulham Palace grounds, which, by the way, is the residence of the Bishop of London, were these curious war implements of the past. The four vehicles in the first illustration are old British and Roman war chariots. The long small-bore gun is a 2-in. cannon used by Charles I. at the battle of Naseby, while the barrel-like device is a bombard used at the battle of Cressy. The three-barreled gun was captured from the French at the battle of Malplaquet.

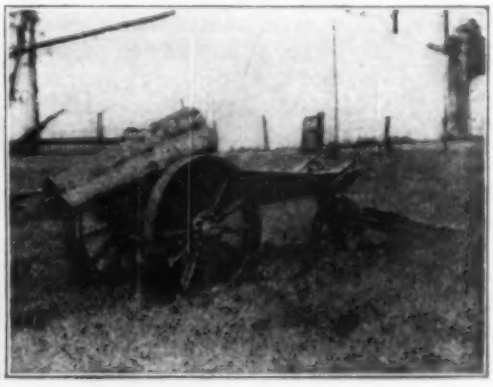


Gun Used by Charles I

A comparison of the chariots in the first illustration also demonstrates the broad stretch of civilization between the early Britains and the Romans. The chariots of the former are crude affairs, while the latter are masterpieces of design.



An Ancient Bombard



Gun Captured from the French

VEIN MINES NEVER BECOME EXHAUSTED

Placer mining districts become exhausted in time, but the life of vein mines seems unending, although many years of rest may occur between operations.

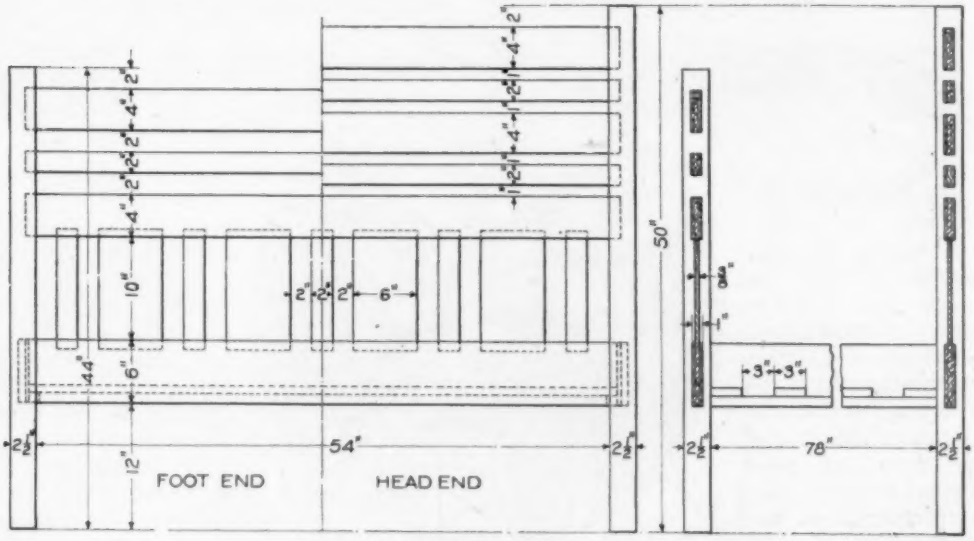
"In the history of the world no district of vein mines has ever been exhausted," says the Mining World in a sweeping statement. "No record exists of a district that has been completely worked out. The mines of Cornwall were worked for their tin nearly 3,000 years ago, and these mines are yet a very important source of the world's supply. The silver mines of Laurium, in Greece, have a known history of 2,500 years, and are still being worked. More than 10,000 slaves were working in these mines in 500 B. C."

Ancient mines in Africa, and especially in Rhodesia, are producing heavily, adding nearly $15,000,000 every year to the world's gold supply.

¶An electric lighting plant has just been installed in the ancient city of Tarsus, Asia Minor. Power is derived from the Cydnus River.

HOW TO MAKE A MISSION BEDSTEAD

The accompanying sketches show an artistic design for a mission bed, so simple in construction and design that most any one that has a few tools and a knowledge of their use can make it. It is best made of quarter-sawed oak, as this wood is the easiest to procure and work up and looks well with any finish. If the stock is ordered from the mill ready cut to length, squared and sanded, much of the hard labor will be saved.



Details of Oak Bedstead

The following is a list of the material needed:

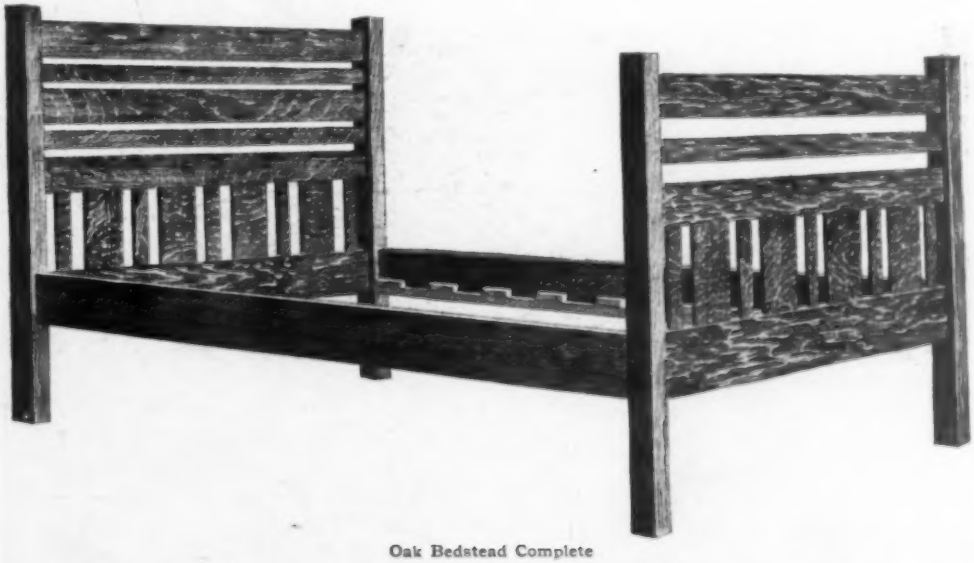
2 posts, 2½ by 2½ by 50 in.
2 posts, 2½ by 2½ by 44 in.
2 end rails, 1 by 6 by 56 in.
2 side rails, 1 by 6 by 78 in.
5 end rails, 1 by 4 by 56 in.
3 end rails, 1 by 2 by 56 in.
8 vertical slats, ⅜ by 6 by 11½ in.
10 vertical slats, ⅜ by 2 by 11½ in.
2 cleats, 1 by 1 by 78 in.
5 slats, ¼ by 3 by 55½ in.
20 blocks, 1 by 1 by 3 in.

Square up the four posts in pairs and lay out the mortises as per drawing. To do this, lay them side by side on a flat surface with the ends square and mark them with a try-square. The tenons on the end rails are laid out in the same manner as the posts. Four of

the end rails should be marked and mortises cut for the upright slats as shown in the detail drawing. The tenons on the end rails are about 1 in. long, while those on the slats can be ¾ in. long. Fit all the parts together before gluing to see that they fit square and tight. After the glue has been applied, clamp them together perfectly square and set them away to dry. They should dry at least twenty-four hours before the clamps are removed.

While the ends are drying, the side rails can be made. These have a 1-in. square cleat screwed to the inner side for the slats to rest upon. If springs are used, five slats will be sufficient. They can be placed where the springs will rest upon them. After the position of the slats has been located, nail small blocks at their sides to hold them in place. For fastening the side rails to the posts, patent devices can be purchased at a local hardware store. The posts will have to be mortised to receive these, and care should be exercised to get them in the right place.

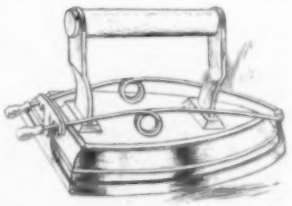
When the bed is complete, go over it carefully and scrape all the surplus glue from about the joints, as the finish will not take where there is any glue. Remove all rough spots with fine sandpaper; then apply the stain you like best, which may be any of the many mission stains supplied by the trade for this purpose. If this bed is well made and finished, it will be an ornament to any home.



Oak Bedstead Complete

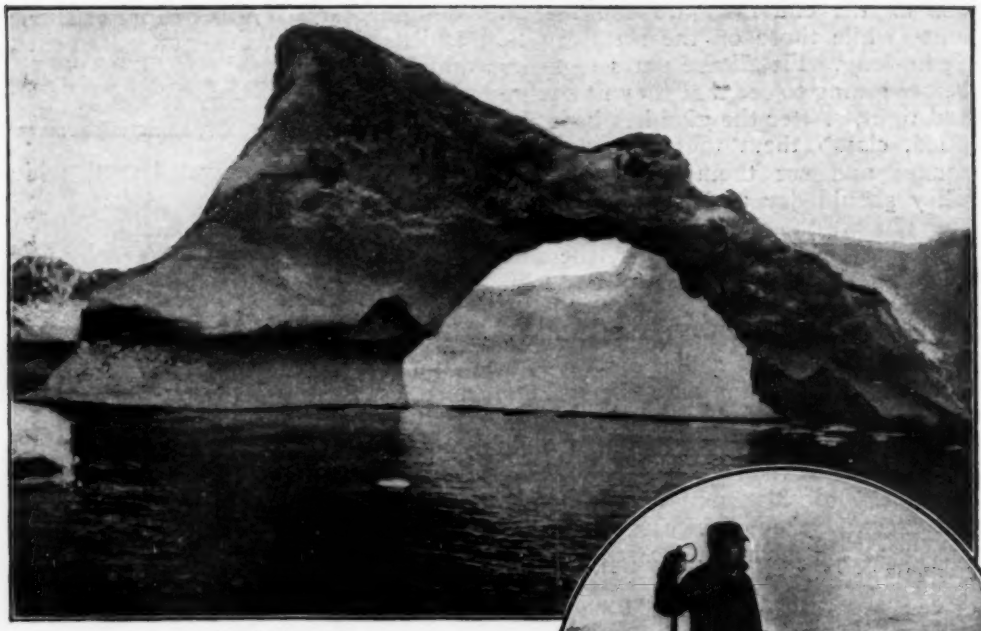
OLD FLATIRONS MADE NEW

A shoe of thin nickeled steel, which can be attached to any old flatiron is here illustrated. The old iron, it makes no difference how worn and rough, is first heated over the fire and then the shoe is slipped on, the spring attachment holding it solidly in position.



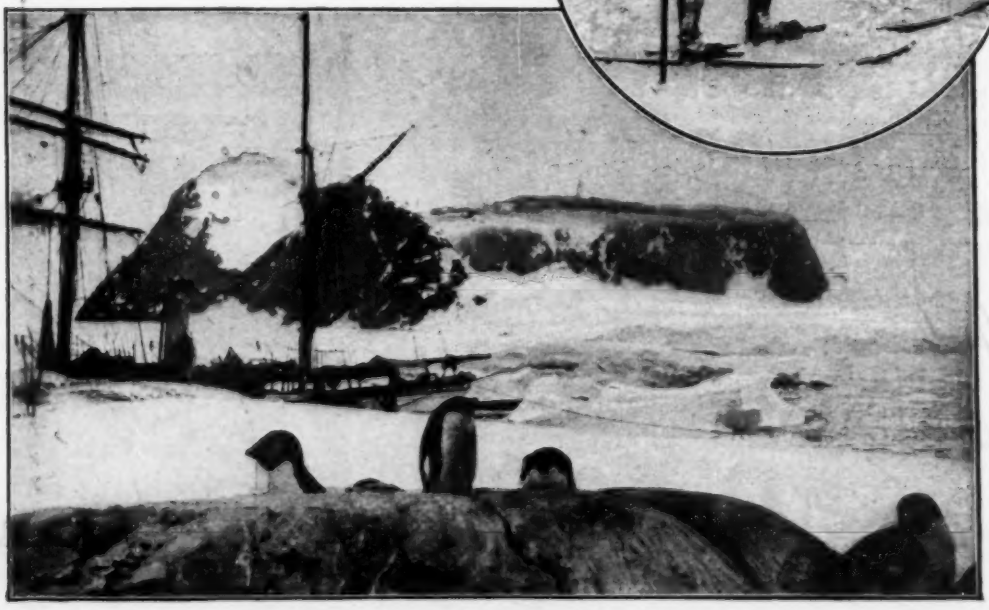
¶The first raft of pulpwood to be towed across Lake Superior from the Canadian to the American side was brought into Ashland, Wis., a few weeks ago. The shipper figured that if 75 per cent reached shore, the venture would pay. Considerably less than 25 per cent was lost.

The French Expedition to the Antarctic



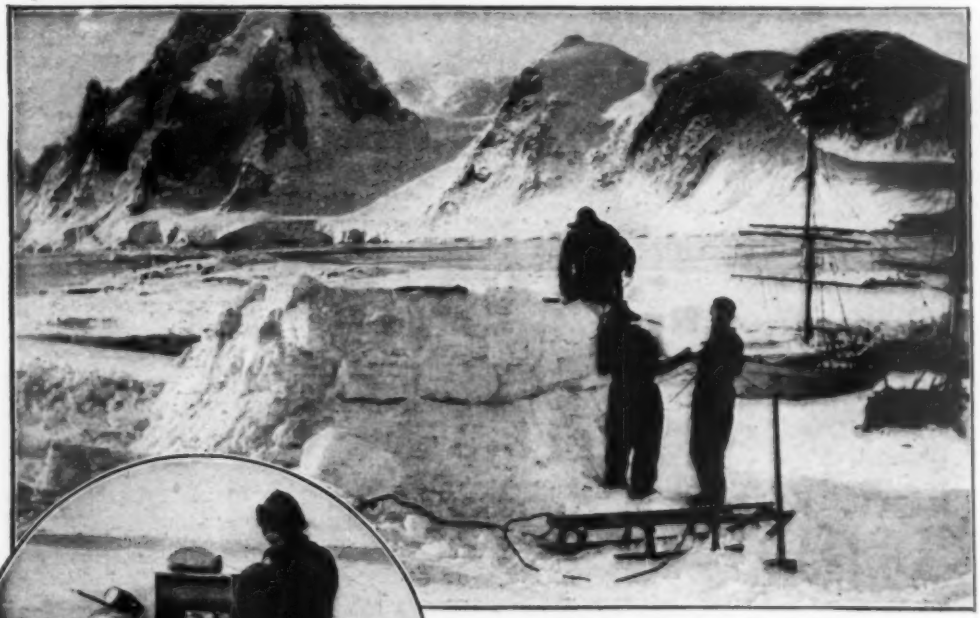
An Arch of Ice

Although it failed to decorate the South Pole with the flag of France, the expedition which pierced the Antarctic under Dr. Charcot made some valuable scientific observations and discovered new land east of King Edward's Land.



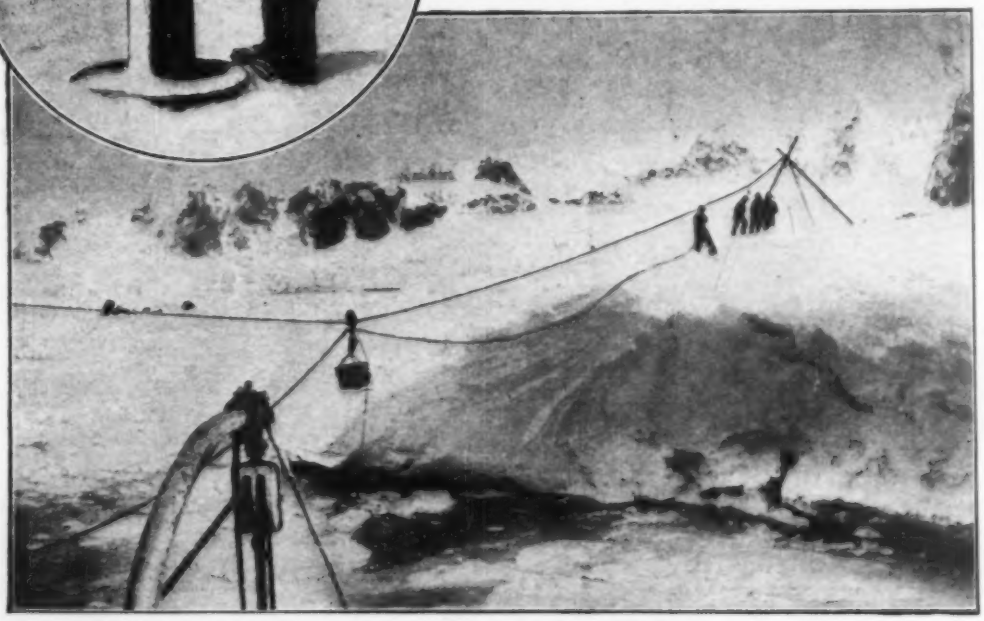
Winter Headquarters—Note Penguins in Foreground Dr. Charcot

Which Made Some Valuable Observations



Constructing Cache for Supplies

These illustrations were made from photographs just received in this country. Although the expedition returned in June, they were withheld for some time. They are remarkably clear for photographs taken in the subdued light of the Antarctic.

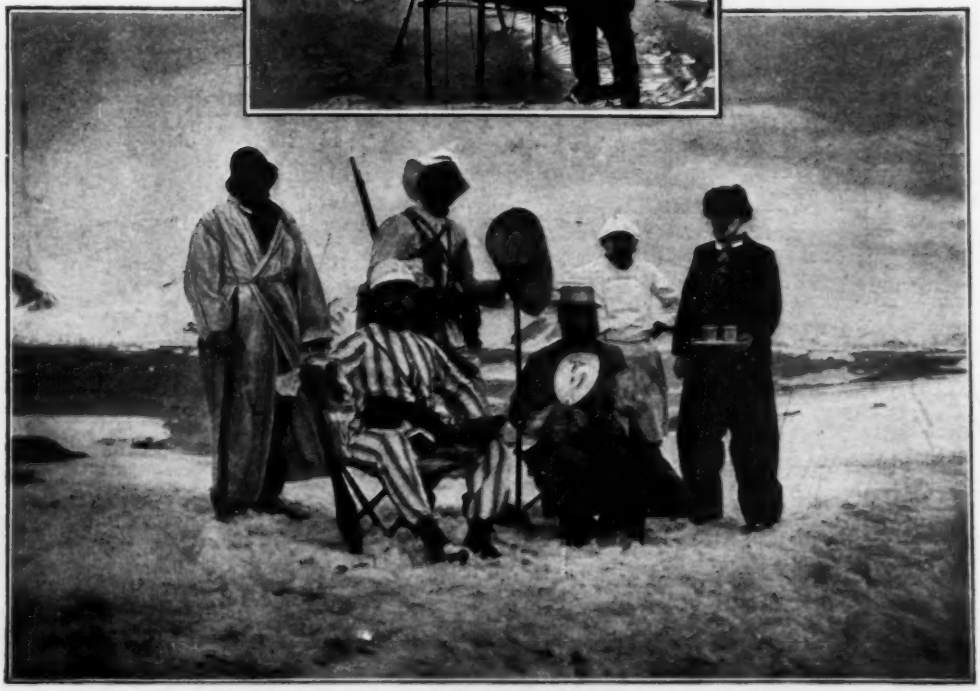


Making Magnetic Observations

Landing Supplies from Ship

Making Observations to Find Altitude

The Meteorological Station

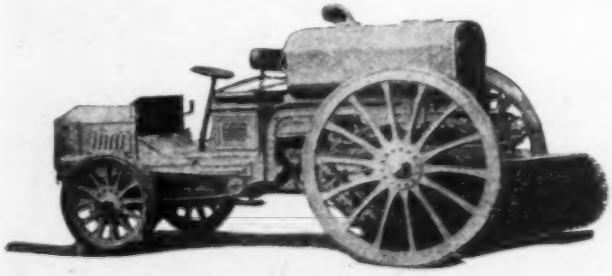


The French Antarctic Expedition Celebrating Mardi Gras Under the Southern Cross

PREVENTIVE OF SCARLET FEVER COMPLICATIONS

Two German physicians announce, after two years' study of the effects of various forms of a specific anti-streptococcic treatment upon scarlet fever, the discovery of a cure for at least the serious after effects of the disease. While admitting that the streptococcus (a long or short chain of cells more or less curved) is not the cause of the disease, and that in the malignant, rapidly fatal cases, it plays no part, they contend that in the severe anginose forms of scarlatina it is constantly present as a secondary infection, and in such cases is more responsible for the fatal outcome than is the scarlatina virus itself.

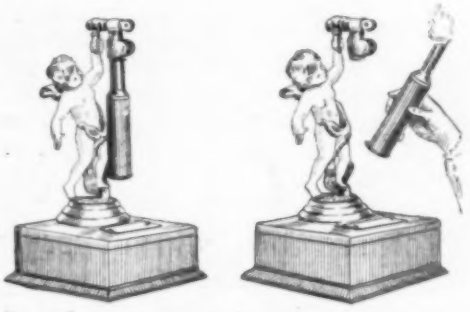
Some 62 cases of scarlet fever, all of which were unusually severe owing to the severity of the infection, were treated by the experimenting physicians, a serum prepared by inoculating horses with cultures being used in connection with vaccine. The majority of the cases treated appeared to be hopeless at the time of the inoculation, but only 24 of the patients died, and of the remainder, the freedom from complications was said to be remarkable. In the entire series there developed not one case of Bright's disease, a common result of scarlet fever. Shortly after inoculation, in nearly all the cases, the appetite of the patients improved, the pulse and respiration strengthened, and the throat became cleaner. A specific serum that will successfully combat the scarlatina virus itself is yet to be discovered.



Motor Revolves Brush

CIGAR-LIGHTERS FOR THE HOME

The cigar-lighter is usually associated with the top of a cigar show-case, but more or less artistic designs of electric cigar-lighters are now being produced and are finding a ready sale as objects of both ornament and service in dens or other rooms where smoking is usual in the home.



Ornamental Cigar-Lighter

The cigar-lighter here illustrated is an excellent example. It is an ornamental Cupid design, heavily gold-plated, with a leatherette-covered torch. The base is made either of mahogany or weathered oak.

AUTOMOBILE STREET SWEEPER

An automobile street sweeper used in Paris is here illustrated. The sweeper proper is the same type as used on horse-drawn sweepers, but the brush is revolved by chain gear from the motor, instead of by the turning of the rear wheels. The tank mounted on the back part of the body contains water for laying the dust.

¶Old red cedar rail fences of central Tennessee are said to furnish one of the principal sources of wood for pencils.

THE "AEROPLANE" BAIT

This bait is known as the "aeroplane" because of its appearance. The

body is white with polished brass spinners. When used for casting it will float, with the spinner moving on the sides, or the spinners can be so fastened to the bait as to take it down into the water from 6 to 10 ft., according to the length of line used.

HONGKONG'S "WIRELESS" ORDINANCE

Hongkong, being an English crown colony, has a wireless telegraph ordinance very much the same as that in vogue in England. All apparatus on a merchant ship in the territorial waters of the colony must be worked in such a way as not to interfere with naval signaling, or with the working of any wireless telegraph station, especially when the latter is sending messages to ships at sea. Also, no apparatus on board a merchant ship shall be worked or used while such ship is in any of the harbors, except with the special or general permission, in writing, of the postmaster-general of the colony. If at any time, in the opinion of this official, an emergency arises in which it is expedient for the public service that the government have control over the transmission of messages, ships in territorial waters shall be subject to such further rules as shall be made.

These regulations apply to all conditions except the making or answering of signals of distress.

A HOUSE BUILT OF LAVA

One of the most attractive little homes in Tucson, Arizona, is built of the rough lava blocks which are plentiful on the mountain slopes thereabout. As the blocks are not shaped nor smoothed, they lend a certain rustic appearance to the building, which is very inviting. The lava is porous and of a dark color, as if it had been burned or scorched. It will be noticed that the fence is of the same construction, giving a harmonious appearance to the place.

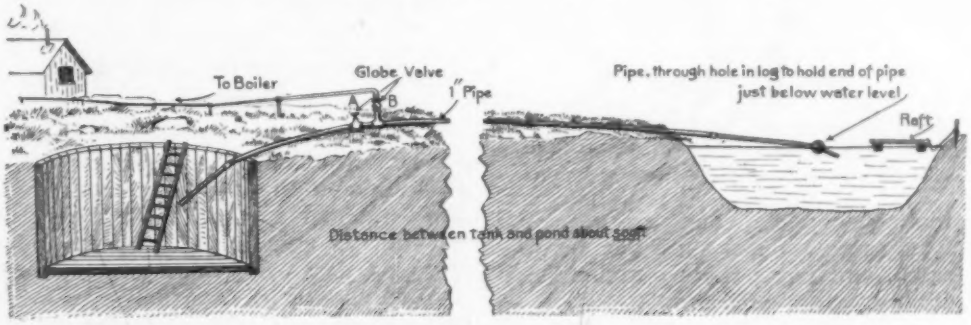
A curious bit of gossip concerning the house is that the builder became dissatisfied with it for some reason and decided to raffle it, and, as gambling was allowed in Arizona until the last few years, there was enough of the spirit of chance in the community to cause a ready market for his tickets. It is said that in this way the place was disposed of at a large profit.

Made of Volcano's Product

SHOP NOTES

Siphoning Water from a Pond

A steam boiler, using water from a tank supplied by rain from the roof, had to be shut down during the dry season. On one occasion when the water supply failed and the plant was shut down, I decided to fill the tank from an old cellar that had been discarded on account of striking a spring that would fill it in about a day and a half.



Filling Tank with a Siphon

I put a line of 1-in. pipe to the cellar, extending the end to the middle of the pond. A hole was bored in a log of wood and the end of the pipe was inserted through the hole far enough to keep it just below the surface of the water. A raft was made from two railroad ties and used to get at the end of the pipe for filling it with water. A piece of pipe having sufficient length to reach almost to the bottom of the tank was attached to the pipeline at an angle. The end in the tank was plugged and the end in the pond raised and the whole pipeline filled by using a funnel, then the end was lowered into the water and the plug removed from the pipe in the tank. This started the siphon and the tank was filled.

At times when the water in the tank would be low and there was not enough water in the boiler to safely start a fire in the morning, I would close the globe valve A, and open the valve B. The vacuum formed in the boiler caused by the steam going down would be sufficient to draw water up from the pond and into the boiler to a level where it would show in the bottom of the gauge. The siphon would be started and the tank filled. This arrangement was kept in successful operation for a long time, or until natural gas was supplied to the city. Then a gas engine was installed to take the place of the steam engine.—Contributed by C. G. Smith, Brooklyn, N. Y.

To Keep Varnish from Crawling

Painters often have trouble in keeping the second coat of varnish from crawling away from the first, especially in cold weather. A simple remedy for this is to go over the first coat with benzine and allow it to dry before applying the second coat of varnish. The benzine leaves a gray film upon the varnish, which does not injure it in the least and causes the second coat to stick. To do a first-class job of varnishing, the temperature in the room should be about 65 deg. F.—Contributed by F. L. King, Islip, L. I.

Joining the Limbs of a Tree

When a tree is small, but with sufficient growth, select two small branches

Limbs Joined Together by Nature's Growth

growing opposite and as near the crotch as possible, as shown at A in the sketch, and twine them together horizontally, one overlapping the other as a rope is twisted, leaving the ends free as in B. It will take about a year for nature to join them. Then prune the ends off smooth and in time as the bark expands through the growth of the tree the connection will become as one solid piece, C, thereby binding the limbs together. This method may be used several times in one tree. Trees treated in this manner will not split through rapid growth or by the wind. This method can be applied to all fruit trees except the peach tree.—Contributed by D. English, Norwood, O.

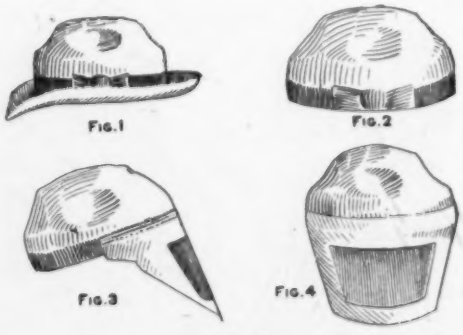
Coloring Iron and Steel for Laying Out Work

Various substances, such as blue vitriol, red lead, soapstone, chalk and Prussian blue, are used to coat metals which are to be laid out. There is a good method of doing this work, however, which requires none of these coloring substances, in fact, requires nothing but a fire. The lines show up clearly, and are finer than can be made with any of the above named substances.

It will not jar off, and the metal can be filed right up to the line, which makes it especially useful to tool-makers. To prepare the metal, simply put it in the fire, preferably inside of a piece of pipe, and heat it anywhere from a blue to a dull red. Then cool it quickly in water. This leaves the surface blackened, and lines scratched on it show up bright and clear, and the contrast between the black and the bright, clean-cut line is agreeably marked.—Contributed by D. Hampson, Middletown, N. Y.

Protector for the Eyes While Grinding

Glass protectors for the eyes are not always satisfactory, as they are liable to become covered with moisture from the perspiration of the face and make it hard for the user to see. Persons doing a great deal of grinding on emery wheels should protect their eyes with some kind of a shield. The one shown in the illustration is easily made and can be used with more comfort than ordinary glasses. Take a felt hat, Fig. 1, and remove the rim as shown in Fig. 2. Make and attach a cardboard shield as shown in Fig. 3. The cardboard has

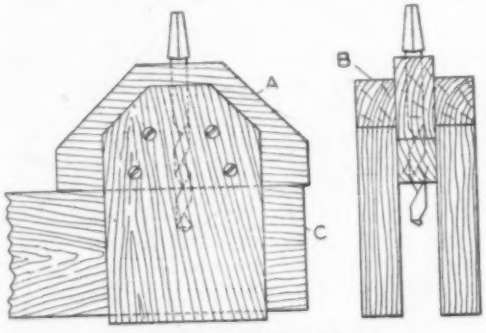


Cap and Eye Protector

an opening cut out and a piece of celluloid stitched in for the transparent window.—Contributed by C. C. Brabant, Alpena, Mich.

Gauging Dowel-Pin Holes

When boring dowel pin holes in parts that are to be fitted together it is often a very difficult matter to get them in straight so that the parts will fit squarely when assembled. When a number of holes are to be bored, the little gauge shown in the accompanying sketch will prove quite handy. It is a time saver and also insures accurate work. It consists of a block A, to which the two side pieces B, are fastened with screws. The block A has a hole in it to guide the bit. The side pieces serve to hold it squarely on the work. Make a punch mark on the work C to be bored, and slide the gauge over it until the point of the bit strikes the mark. Then bore the hole for the dowel. The gauge is to be held steadily

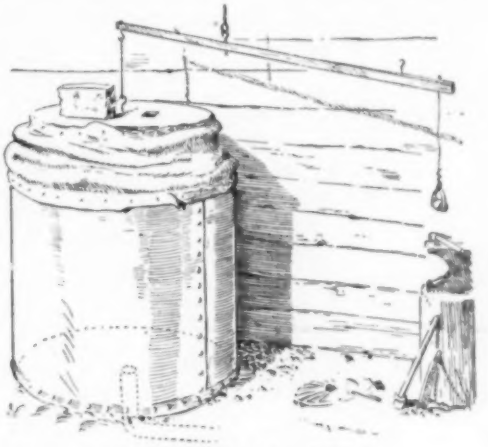


Boring Dowel Holes Straight

on the work with one hand while the other turns the brace and bit.—Contributed by Edward Moore, Philadelphia, Pa.

Blacksmiths' Bellows Made from an Old Tank

A serviceable blacksmiths' bellows can be made from an old tank by arranging it as shown in the accompanying sketch. Secure an airtight tank and remove the top. Fasten a wide band of soft and pliable leather around the top with a hoop and some rivets making an airtight joint. Make a round wooden top somewhat smaller than the opening in the tank and fit an air valve on the under side of it. Tack the upper edge of the leather to this top, care being taken to get it as nearly airtight as possible. Attach a handle as shown



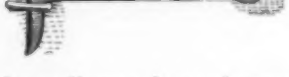
Old Tank Used for Bellows

and place a weight on the top to make the leather fold into the tank, and to give pressure to the air. A few strokes of the handle will compress enough air to hold the leather up, then the weight in bringing it down forces the air to the tuyeres through the pipe at the bottom of the tank. This bellows does not need to be pumped steadily if the leather band is made wide enough, as sufficient air will be stored in the tank under pressure to supply the needs of the forge for some little time.

The tank can be put up out of the way, either in a corner or above the furnace hood, the lever hooked to the ceiling, and a wire handle run down to within reach.—Contributed by F. M. Berchmaus, Scio, Ore.

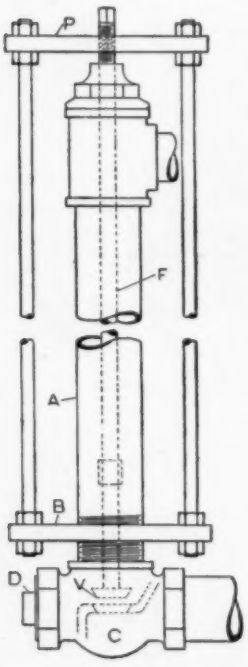
Makeshift Hook Lock

A simple lock for a hook is made by driving a nail about 2 in. above the staple and bending the end over so it can be turned either way. To lock the hook, turn the nail over it as shown in the sketch.—Contributed by Thos. L. Parker, Olaf, Iowa.



Home-Made Steam Trap

A steam trap is a self-acting device by means of which water that accumulates in a pipe or vessel containing steam will be discharged without permitting steam to escape. The means of doing this are various. Most of the traps make use of the expansion of metals to open a valve and the one shown in the accompanying sketch is no exception.



The pipe A can be of any size and should be at least 3 ft. long and have enough threads cut on the lower end to permit it to be screwed through the plate B, then into the globe valve C which has the bonnet removed. This valve should have the one end plugged as shown at D. A tee is screwed to the upper end of the pipe A, and on this is screwed the bonnet of the valve C. A rod, F, is connected to the valve stem and has the upper end threaded to screw through the plate P for adjustment. The end of the rod is square so that a wrench can be applied. The two plates B and P are held apart by means of the side rods R which have lock-nuts at both ends.

In operation the water accumulates in the pipe until the rod cools and contracts, thus opening the valve V, allowing the water to escape. As soon as the water is replaced by steam, the rod expands and closes the valve. This trap is very easily made and if properly adjusted, will work as well as any of the expensive ones upon the market.—Contributed by J. E. Noble, Toronto, Canada.

Breaking Large Bottles with Boiling Oil

The method of breaking small bottles or vessels at the place wanted with a kerosene-soaked string is well known, but this method does not work so well with the larger vessels. Following is a method by which any sized glass vessel can be broken,—as for example, a glass tub to be made out of a carboy:

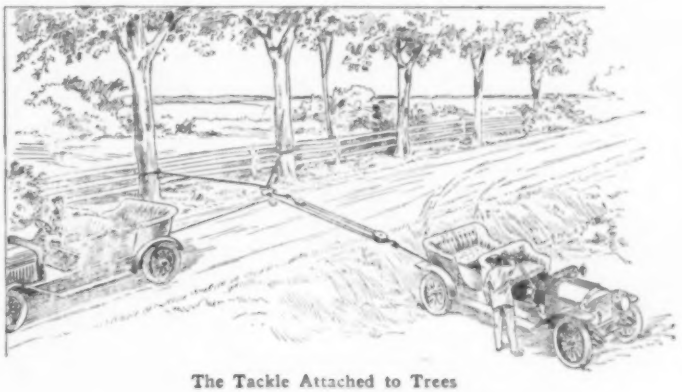
Fill the vessel with cold water up to the point at which it is to be broken. Pour enough boiling oil over the water to make a good coat on the surface, and before the oil has time to cool, dash cold water on the outside of the vessel. A clean break at the contact point of oil and water will be the result.—Contributed by F. M. J. Berchmaus, Scio, Oregon.

Substitute Bowl for a Lamp

A fruit jar is a very handy article to use as a temporary lamp bowl when that part of the lamp is accidentally broken and you cannot replace it at once. Take the fruit jar cap and cut a hole in the top with an old knife, the size of the screw end on the lamp burner. Make the hole so the burner will fit tightly in the cap, and then use wax or soap to seal the burner in place to keep out the air. The only precaution is to have the burner fit the hole tight enough to keep it in place. This temporary bowl, used with care, will give good service until a new lamp or a new bowl can be procured.—Contributed by C. C. Brabant, Alpena, Mich.

Removing an Automobile from a Ditch

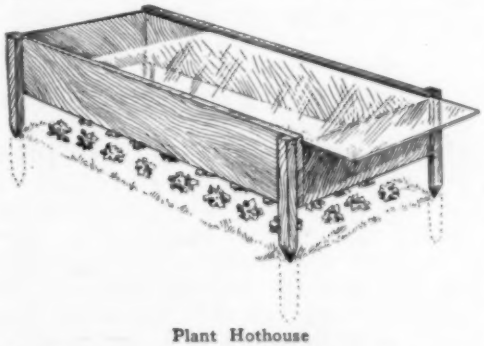
It is a true saying that "necessity is the mother of invention" and so it is that only a few know how to properly apply tools and material at hand in the case of an emergency. The accompanying sketch shows how I rigged a tackle to a very unusual condition in a case where an automobile was ditched and a straight pull could not be made, as the roadway was too narrow. A block and tackle was used with the double block near the load to increase the efficiency. The sketch clearly illustrates how the tackle was applied.—C. G. S.



The Tackle Attached to Trees

Small Movable Hothouse for Plants

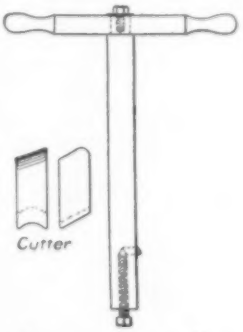
The small hothouse shown in the illustration can be used to protect plants from severe cold weather and high winds. The house can be moved from place to place to cover delicate plants or start seeds early in the season. It consists of a box without top or bottom and grooves cut for inserting a glass cover. The stakes at the corners will sink into the soil, holding the house firmly in place. The glass can be removed during the day and closed at night.—Contributed by W. A. Jaquythe, Richmond, Cal.



Plant Hothouse

Hand Boring Bar for a Large Pulley

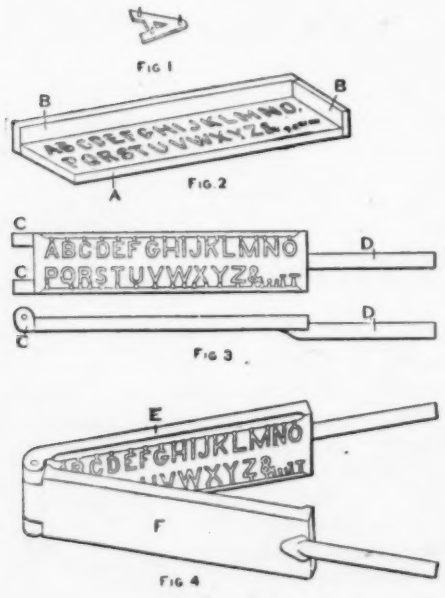
Large diameter pulleys and gears are often brought to the small repair shop to be rebored. If the shop does not have a lathe or boring mill large enough for the purpose, some other method must be employed. The job can be done very easily by hand if a tool like the one shown in the accompanying sketch is made.



To make the tool procure a piece of shaft that will just fit the hole already in the gear or pulley. Square one end and attach a handle as shown. Drill a hole in the bottom end of the shaft and tap it for a set screw. Cut a square hole at the upper end of this for the cutting tool. A sufficient amount of shaft should extend the cutter to act as a guide. Forge the back end of the cutting tool to fit the taper on the end of the set screw. In making a cut, turn the set screw up until the tool cuts as deep as is wanted. If more than one cut is made, a sleeve must be slipped over the lower end of the bar to act as a guide, as after the first cut the shaft would not fit the hole.—Contributed by J. N. Bagley, Webber, Kans.

Home-Made Pattern Letters and Figures

In carrying out the modern systems of the classifying, marking and recording sets of foundry patterns, it is frequently necessary to use large quantities of pattern letters and figures. A



Mold for Letters

condition of this nature occurred recently, in which many thousands of letters and figures were needed to properly inaugurate a new system of this kind, says a correspondent of the American Machinist. After a somewhat lengthy consideration of the matter, the following method was worked up and used with entire satisfaction, not only as to its efficiency and economy, but as to the quality of the product and the ease with which the letters and figures were applied to the patterns. The method of doing this work was as follows.

The letters and figures wanted were each to have two or more sharp points projecting from the back, by which they might be quickly and permanently attached to the pattern. This form is shown in Fig. 1. The plan was to make good and durable molds and to cast the letters of an alloy similar to type metal. To make molds of metal, as brass, and work out the forms by hand would have been much too expensive. Therefore some cheaper method must be devised.

In making the molds, several sets of good pattern letters and figures of the "sharp gothic" style were purchased. A ½-in. board, A, as shown in Fig. 2, was prepared shellacked and rubbed down, after which a rather heavy coat of shellac was applied and the letters arranged upon it as shown, while all around it were placed the strips BB in box-like form. The letters were very slightly oiled, and plaster of paris was mixed rather thin, poured into this box and as it was beginning to set was rammed down hard. When the plaster had thoroughly set, the strips BB were carefully removed and the plaster cast separated from the board A and the letters. It was then smoothed up on the back. The chamfers to facilitate, pouring and the "gates," one or more to each letter, were carefully cut, and it was given two light coats of shellac. The hinge lugs CC and the handle D were made of wood, but not attached to the plaster. This served as a pattern which was carefully molded in fine sand and a casting made of brass. The casting appeared as shown at E, Fig. 4.

In the meantime a wood pattern was made for the other half, F, of a jointed mold shown in Fig. 4, and also cast of brass. This casting was planed up on the face and casting E fitted to it by a slight straightening with a hammer and a file finish. The two were then clamped together and the rivet hole in the hinge lugs drilled and the rivet inserted. It will be noticed that the alphabet is arranged in two lines so as not to make the mold too long and narrow, and the "gates" so made as to pour the metal from either side so as to avoid long gates,

which would have the effect of cooling the metal and result in defective letters.

A smaller mold for figures was made in the same manner, except that in arranging the figures there was one of each figure, with the exception that there were three of figure 1, two of figure 6 (reversed to form the 9), and four of the figure 0.

The sharp points on the back of the letters and figures were provided for in this manner. The mold was closed and some melted lead, heated very hot, was poured into the mold. This marked the outline of the letters on the plain side of the mold. The location of the points was then marked with a prick punch. A small twist drill was ground to the proper form and the holes drilled to the depth required.

The molds having been made, the more difficult conditions of casting had to be considered and solved. This required considerable patient experiment in order to obtain a proper alloy, and to ascertain the proper temperature of the mold. This temperature was finally found to be much higher than at first supposed practicable. First the proper alloy. Various proportions of lead, antimony and bismuth were tried. A fair success was reached, with one of lead, 90 parts; bismuth, 10 parts. But this was later on improved by one composed of lead, 70 parts; bismuth, 12 parts; antimony, 18 parts.

Possibly the addition of a small quantity of tin might have improved the alloy, but in practice it is well to avoid too many ingredients lest mistakes in the exact proportions occur

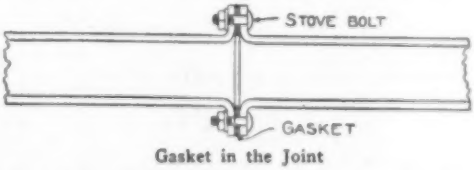
In the process of casting, the mold was closed and clamped by slipping a ring over the handles in the same manner that the blacksmith does over his tongs. It was necessary to heat the molds over a gas flame, hot enough to slightly discolor a pine stick held against them. The alloy was melted over a Bunsen burner, care being used not to overheat it, as even slightly overheating tended to destroy its fluidity. The test used was that it be hot enough to burn a pine stick to a rich brown.

An apprentice boy in casting these letters and figures used two molds, one in the process of heating, while he was casting with the other. By the use of these molds and the proper alloy, a boy was soon taught to be able to produce between two and three thousand good letters and figures per day. There was no finishing work required except to clip off the "gates" with a ¼-in pattern-maker's chisel, held at the same angle as the inclination of the side of the letter.

Lead Pipe Connection without a Wipe Joint

The accompanying sketch shows how a quick repair was made on a heavy lead pipe. In moving my sink from the basement to the first floor I had to lengthen the lead pipe, and not having the necessary tools or knowledge for making a wipe joint, I used the following method to join the ends of the pipe:

A child's top was used to turn out the lead on the ends of the pipe. This being done, I cut a rubber gasket from the sole of an old rubber shoe, placed it between the flanged ends of the pipe, and then drove a nail through the lead and rubber to make holes for the bolts. Four common stove bolts were used in



Gasket in the Joint

drawing the flanged ends tightly together on the gasket.—Contributed by C. C. Brabant, Alpena, Mich.

¶A heavy lathe cut will not do accurate work.

Housing a Clothesline in a Post

The care of the ordinary rope clothesline is not a little task when it must be put up and taken down each time there are clothes to dry. The line cannot be kept clean, nor will it last long if left stretched between posts all the time. A simple method for housing a line, and one that makes it handy to place the rope between posts quickly is shown in the sketch. The housing consists of a hollow post used for one of the line posts. The bottom part of this post is a solid piece of square timber, set in the ground and the top part boxed in with 1-in. boards. In Fig. 1 is shown the post complete. The rope passes over a series of pulleys, similar to a block and tackle, to which a weight is attached. The arrangement of the pulleys is shown in Fig. 2. It is obvious that when the rope is detached from the outer post it will be drawn by the weight into the hollow post, where it is housed until the next washday.—Contributed by Herbert Hahn, Chicago, Illinois.

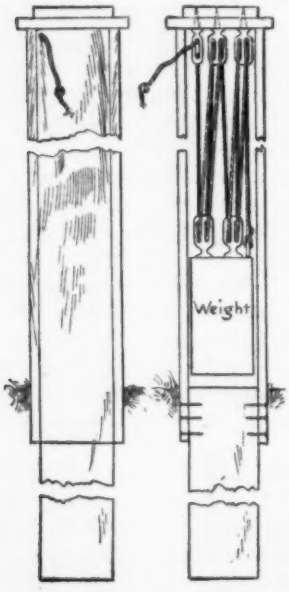


Fig. 1 Fig. 2

Preparing Plaster Walls for Papering

When preparing a ceiling for papering do not pull down any loose plaster, but get some tin washers used for fastening tar paper on roofs. Fasten the plaster on with these in the same manner as putting on the tar paper, driving the nails into the joists. Cover the washers over with plaster-of-paris. The washers will support the plaster and the paper can be put on in the usual manner.—Contributed by Norval Bradley, Paterson, N. J.

Wedge Vise for a Woodworker's Bench

The vise consists of three blocks of 2-in. pine, two of which are nailed solidly to the bench. Two of the blocks, one which is nailed and the wedge, are slightly beveled. This is to prevent the wedge and also the board from rising. The vise is tightened by placing the board to be held between the blocks and driving the wedge in tightly. The wedge is driven back to loosen the grip. In Figs. 1, 2 and 3, is shown respectively the side, end and plan view, and in Fig. 4 the perspective of the finished vise. The grip of this vise will not mark or otherwise injure the wood being held by it.—Contributed by Aaron Austin, Ontario, Can.

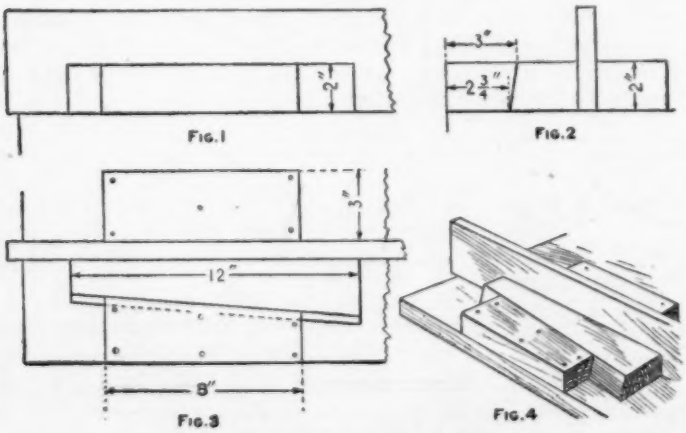


Fig. 1 Fig. 2 Fig. 3 Fig. 4

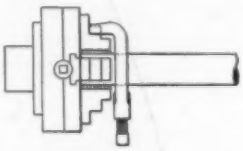
Vise Made of Blocks and a Wedge

Preventing Sore Hands Caused by Metol Developer

In using metol as a photographic developer, it sometimes happens that the hands of the operator become affected in certain places with a sort of eczema, causing the skin to peel off in scales and finally producing sores and wounds. By accident I happened to find an excellent remedy for this skin trouble in the juice which is pressed from the pores of a fresh orange peel, says a correspondent of the Moving Picture World. In case of eczema of this kind, several applications of this juice rubbed into the affected skin will cure the trouble in 24 to 48 hours, producing a perfectly smooth skin. In severe cases the healing process will take a little longer.

Holding Heavy Work in a Chuck

The accompanying sketch shows a handy method of assisting a chuck to drive heavy work. With a universal chuck it is especially useful as it is sometimes difficult to drive a heavy cut without having the chuck so tight that it is under a strain. As this is poor policy the lathe dog may be used to help out as shown. It is driven by its tail, which is set against one of the chuck jaws, thus working in conjunction with the chuck as driver.—Contributed by D. A. Hampson, Middletown, N. Y.



Adjustable Swing Table

A table or shelf which can be swung into the position most convenient, or out of the way when not in use, and that can be adjusted to any height, is a handy addition to a workbench. It can also be used as a seat. Fasten an iron pipe, P, firmly at the top and bottom by sinking it into wooden blocks, BB, which are nailed to the wall or a post. Cut a piece of board to the size and shape desired for the shelf. To this fit an iron strap, S, 2 or 3 in. wide, bent as shown in the detail

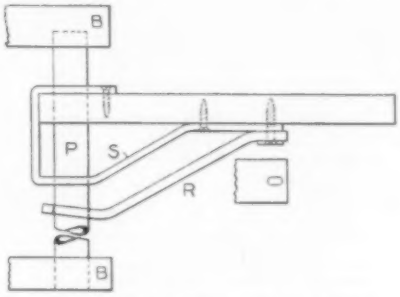
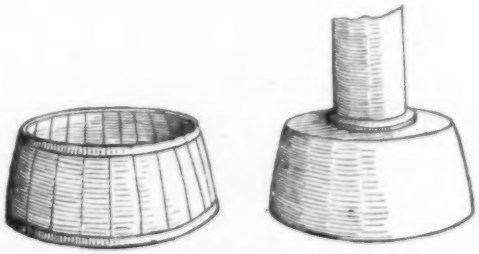


Table Can Be Raised and Lowered

sketch, and drill holes for the iron. These holes should be an easy sliding fit. In another and rather heavier iron strap, R, drill a hole at one end slightly larger than the diameter of the pipe. At the other end make a slotted hole as shown. Bend the strap and attach it to the wooden shelf and the pipe, then by the familiar principle of "binding" this shelf can be adjusted to any desired height and it will hold its position.—Contributed by C. W. Nieman, New York, N. Y.

Round Concrete Column Base Forms

A very cheap and quickly made form for making bases for columns is a barrel or keg sawed in two in the middle.

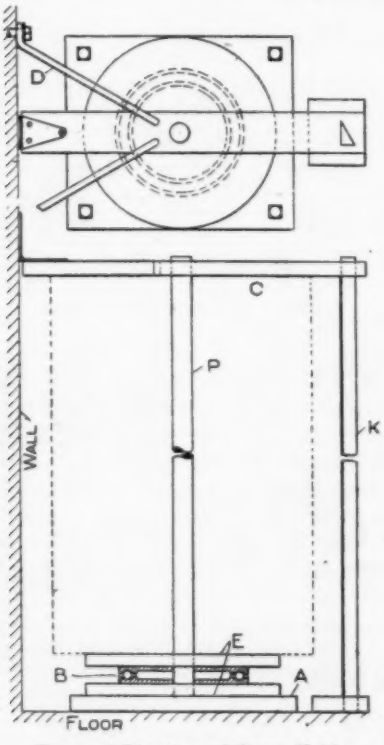


Barrel Used as the Form

The form and the completed base are shown in the accompanying sketch.—Contributed by W. A. Jaquythe; Richmond, Cal.

A Paper-Holder and Cutter

A design of a paper-holder and cutter for large, heavy rolls of paper is shown in the accompanying sketch.



Plan and Elevation of Paper-Holder

This holder may be any size in order to accommodate any diameter or length of roll. The base A is bolted to the floor; then a ball-bearing fastened to it as shown. The balls roll between two iron disks which are bolted to two circular wood pieces, E. The center post, P, may be of wood or gas pipe and should be somewhat longer than the roll of paper to be used. The post is held at the top by a crosspiece, C, which is in turn braced by the side rods D, and is hinged to the wall as shown. The knife K is held in place by means of a block on the floor and the end of the brace C.—Contributed by D. Netter, Meridian, Miss.

¶Do not lubricate magneto bearings too freely.

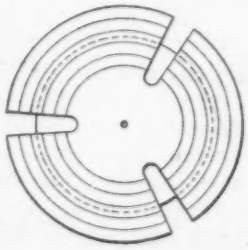
Making Corncribs Rat-Proof

Secure some heavy screen wire and cover the walls and overhead with it, using care about the corners, joints and openings to make them close. Let the wire extend down to the bottom of the crib, then make a concrete floor or bottom, allowing the concrete to come up 2 or 3 in. on the screen wire. This floor can be made on the ground, using plenty of rock for drainage, or it can be made by covering an elevated floor with the concrete.

In this way nearly the entire loss caused by rats and mice can be prevented. The wire will permit the air to pass through the bin as freely as would the usual slat or board construction. In this way the corn saved in one year would pay the expense of the concrete floor and screen lining for the crib, and the lining and floor would last many years.

Centering Tool for Wood-Workers

A sheet-metal disk with notches cut in it, and fine, circular lines drawn on its surface as shown in the accompanying sketch, makes a handy tool for quickly finding the centers of round stock, and is especially adapted for use by pattern-makers and wood-turners. Simply place it on the end of the stock, move it about until the edge of the piece coincides with the concentric lines, as seen through the slots, and then mark the center. It can be made any size desired.—Contributed by P. H. Campbell.



¶Clean coal tar pitch, free from water, acids, or soluble mineral matter, is the most efficient type of covering for iron pipes to prevent corrosion from contact with soil, or electrolysis.

Renewing an Old Window Wiper

In using an ordinary rubber window wiper the corners will invariably wear off, which causes streaks at the edges of the window when used. In this shape it is practically useless and the result is that a new one must be purchased, unless remedied.

By loosening and removing the handle, the rubber center can be pushed through the zinc holder, thus allowing the holder to have the worn ends trimmed off. Trim the rubber center to suit the holder, replace the handle, and the wiper is just as good as a new one, except that it is a trifle narrower. —Contributed by Felix Herz, Goldfield, Colorado.

Home-Made Rubber Curry Comb

One of the best things for removing the loose hairs from a horse when he is shedding is a rubber having an uneven surface. A comb of this kind can be made of a block of wood, ⅝ in. thick, 3 or 4 in. wide and 6 in. long. Tack a piece of corrugated rubber, a piece of rubber stair pad will do, on one surface of the block. Make a handle and fasten it to the other side of the block. The rubber tacked to the block is shown in Fig. 1 and the side view showing the handle in Fig. 2.—Contributed by Earl Streit, Newark, Ohio.

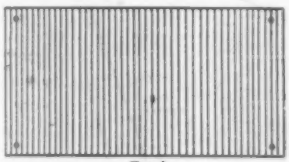


FIG. 1

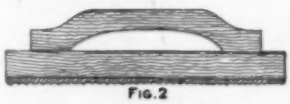


FIG. 2

Door Mat Made of Old Ropes

An outside door mat that will make a good substitute for the expensive metal or rubber mat can be made of old manila rope or clothesline, as shown in Fig. 1. The frame is made up of ⅜-in. lumber, cut to the desired length for the sides and ends. The ends of the pieces are mitered and nailed together. The wooden crosspieces for the center of the mat, each of which should be about 1 in. wide, are cut to fit the inside of the frame. Cut the rope or clothesline in pieces the same length as the wooden crosspieces. Lay the frame on a level surface and start by placing one piece of rope along one side. Then place one wooden crosspiece against the rope and nail through it and the rope into the frame. Continue this process until the frame is filled with alternate pieces of rope and wooden crosspieces. The completed mat is shown in Fig. 2.—Contributed by C. C. Brabant, Alpena, Mich.

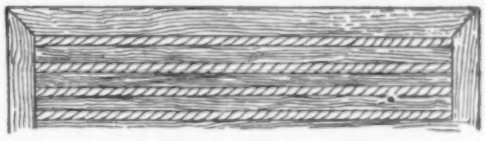


FIG. 1

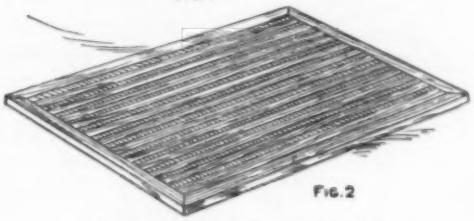
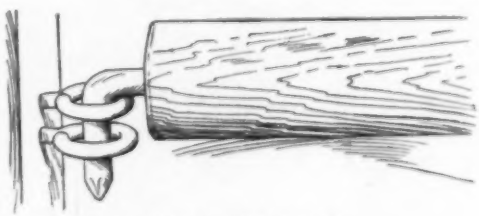


FIG. 2

Frame Made of Ropes and Wood

Sanitary Chicken Roost

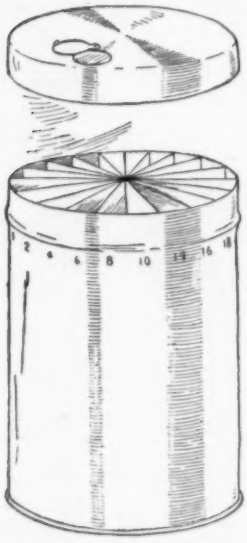
The roost is made round without any groove to harbor insects. It can be quickly removed, cleaned and replaced. Two screw eyes are turned into the wall in a vertical position, from ½ to ¾ in. apart. Each end of the roost is provided with a hook or nail as shown.—Contributed by W. A. Jaquythe, Richmond, Cal.



Hook in End of Pole

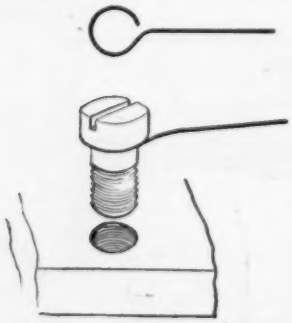
A Twist Drill Box

Small twist drills are apt to become lost or mislaid when not in use, if they are not kept in some special box or place provided for that purpose. A handy and easily made box for holding them is shown in the accompanying sketch. Secure an empty baking powder box and solder as many partitions in it as you have different sizes of drills. Make a hole in the lid, close to the edge, large enough to accommodate the largest drill. Now when the lid is in place on the box this hole can be turned to any desired compartment and a drill removed from it. A slide can be made to fit over the hole as shown. Each compartment of the box should have the size of the drill it contains stamped on the outside.—Contributed by C. G. Smith, Brooklyn, New York.



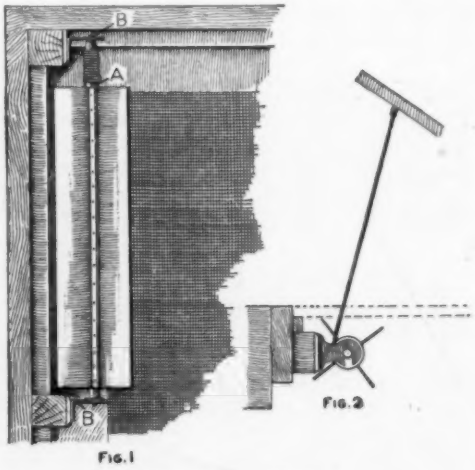
Inserting Small Screws

The illustration shows a method of holding very small screws ready for insertion in their holes, when one finds it clumsy and difficult to hold them with the fingers and manipulate the screwdriver, says Machinery. Take a piece of small wire and bend the end into a loop equal in diameter to the body of the screw. When the latter is dropped into the ring thus formed, it will be supported steadily, so that it can be readily inserted in the hole. After two or three turns with the screwdriver, remove the wire by pulling it. This will straighten it and free the screw.



Driving Flies Away from a Screen Door

The largest number of flies flock to the upper portion of a screen door ready to enter as soon as the door is opened. It takes some time to drive the flies away before opening the door. The illustration shows a device designed to do the "shooing" automatically when the door is opened. In Fig. 1 is shown the corner of the door with the device in place, and in Fig. 2, the top end.



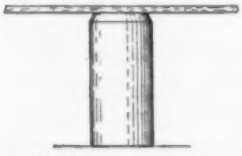
Automatic Fly "Shooer"

An old curtain pole, A, is sawed off within 1 in. of the long, coiled spring inside and then placed in an upright position between the regular pole hangers BB. Blocks are used to make a support for the hangers. A cord having a length equal to the distance from the corner of the door when opened, to the pole, is fastened to these two parts, and the spring is wound up to about the same tension as for a curtain.

Four strips cut from the curtain material are doubled and tacked to the pole just below the cord to form fans. It is apparent that when the door is opened the cord will revolve the pole, and if the fans just touch the door frame, they will make such a noise that no flies will venture near.—Contributed by Frank L. Walter, Dayton, O.

Cutting Glass Disks

A simple method of cutting glass disks is shown in the accompanying sketch. Fasten a short piece of gas pipe in the lathe and bevel one end to a rather sharp edge and to the size you want the disks. The bevel can be inside or outside or both, to get the desired size. Heat the beveled end red hot, then stand the pipe on end and place the glass centrally on the hot beveled end as shown. The hot metal will cause the glass to break out in almost perfect disks.—Contributed by P. H. Campbell.

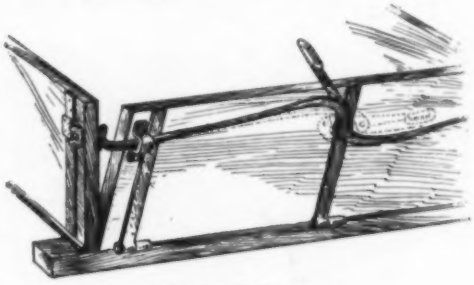


Tool for Putting on Automobile Tires

An old pair of bicycle forks, spread to 8 in. or more, makes a handy tool for replacing automobile shoes and tubes. In operation, put the forks under one side of the shoe and force the tire over to the inside rim, then pry up and you will have free access for placing the valve or lugs. A number of tools can be purchased for this work, but the old bicycle forks will beat them all at much smaller cost.—C. G. S.

Handy End Gate Clamp

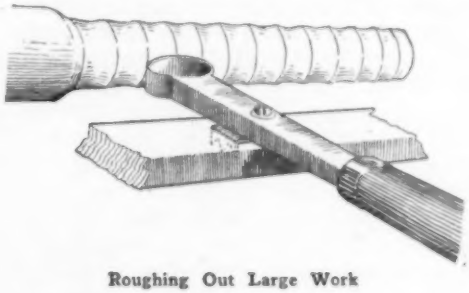
An end gate clamp that can be opened with one hand is shown in the accompanying sketch. Deliverymen, especially, will find this device handy for they can hold packages, crates, sacks, etc., in one hand and open the end gate with the other. This device is very simple and inexpensive and can be made by any blacksmith in a couple of hours.—Contributed by L. W. Van Nasdale, Lemoyne, Pa.



End Board Fastener

Turning Tool for Large Wood Pieces

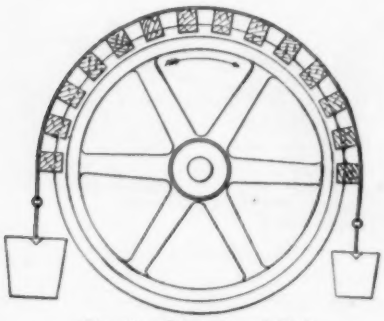
The ordinary tool used in roughing out large pieces of wood has a tendency to catch in the work and cause trouble. In using a circular-edged tool all of the material of the cut will be removed and no jagged ends left to draw the tool into the work. If such a tool is made as shown in the illustration, with a hole or opening for clearance, a deep cut can be made without drawing the tool into the turning wood. The handle is provided with a U-shaped piece of metal having saw-teeth edges on the place where it comes in contact with the rest.



Roughing Out Large Work

Finding the Brake Horsepower

A very accurate way to determine the brake horsepower of a gasoline engine is to use an arrangement as shown in the illustration. The device



Showing Direction of Pull

consists of a number of blocks fastened to an old piece of belt, to the ends of which weights are attached. The blocks are made of pine, and for a small engine, 2 by 4-in. timbers will do. Cut a recess in each block to fit over the rim of the flywheel to prevent them from slipping off when the engine is running. The recesses should be cut about ½-in. wider than the rim of the wheel to prevent them binding on the sides.

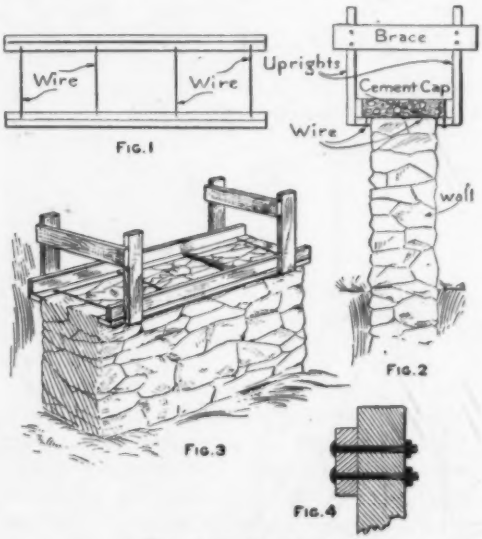
The blocks are fastened with screws to a piece of belt that is long enough to reach over the wheel and hang below the center on each side. Attach a bucket to each end of the belt, one of them larger than the other, the large one being pulled in the direction of the arrow. Place a quantity of sand in both buckets and start the engine. Keep adding sand to the large bucket until the engine is working to almost its limit without affecting the speed. Let the engine run in this manner for a few minutes, until you are sure the test is right, then stop it and weigh the contents of the buckets. The difference in pounds is the number of pounds pulled. Multiply the circumference of the wheel by the number of pounds pulled, the result by the number of revolutions per minute, and then divide the product by 33,000. This will give the actual brake horsepower of the engine.—Contributed by J. N. Bagley, Webber, Kansas.

Protecting a Newly Painted Wall from Flies and Dirt

After the paint on the wall has thoroughly dried, make some laundry starch, thin it out until it will flow nicely under a brush, and apply a coat to the wall. It will dry clearly and protect the paint. When the wall gets dirty all that is necessary to clean it is to wash off the starch and apply another coat.—Contributed by F. L. King, Islip, L. I.

Forms for Cement Coping on Walls

An old, crumbling stone wall can be repaired and given a neat appearance by laying on a cement coping. A contractor repaired such a wall by removing the crumbled portion and placing the cement on top in forms constructed as shown in the sketch. The forms consisted of pine boards, fastened together at intervals with heavy wire, as shown in Fig. 1, to prevent its drop-



The Form Construction

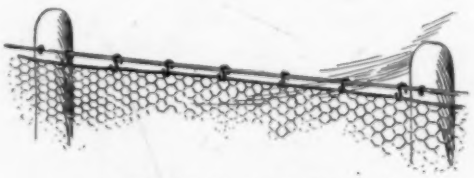
ping down over the wall. Uprights and crosspieces were used, as shown in Fig. 2, to prevent the forms from

spreading. The cement was first laid on the form and then toward the center, from each side. When the cement hardened properly, the crosspieces were loosened to allow the sides of the forms to tilt, then the wires were cut and the forms removed.

Each time the forms were moved and put in place on another part of the wall, new wires were used. In Fig. 4 is shown how bolts may be used instead of nails to hold end pieces together. The bolts will make it much easier to set up and take down the forms when changing them from one part of the wall to another.—Contributed by James M. Kane, Doylestown, Pa.

Keeping Wire Mesh from Sagging

I recently constructed a fence of wire netting in which I substituted a No. 10 iron wire for the wooden frame. The

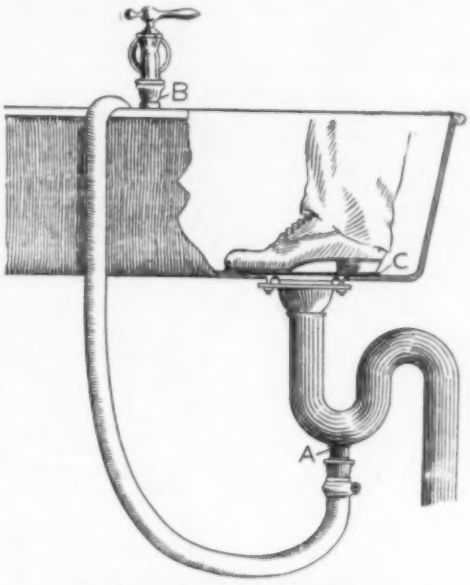


Wire Holding Up Mesh

netting is fastened to the wire at the top by means of hooks made of No. 10 wire and placed about 18 in. apart as shown in the accompanying sketch. This arrangement keeps the wire netting drawn up tight, is easier to put up, and looks better than a fence put upon a wooden frame.—E. M. Dunivant, Ft. Worth, Texas.

To Clean Sink Pipes

Sink pipes often become clogged with refuse and are hard to clean without the proper plumbing tools. The device shown in the accompanying sketch will do the work quite nicely and can be rigged up by anyone. Connect a hose pipe from the brass clean-out cap A to the faucet B, as shown. Place a sheet of rubber, C, and a block of wood over the strainer. By standing on the block of wood to hold in the water and turning on the city pressure at the faucet,

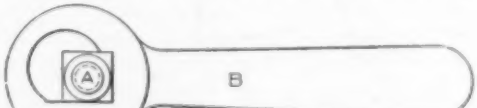


Removing the Obstruction

the obstruction can be easily washed out. If the hose can be attached to a hot water faucet, the flow of the hot water will wash out all grease that may have accumulated.—Contributed by C. G. Smith, Brooklyn, N. Y.

Substitute for a Ratchet Wrench

A common wrench can be made to operate the same as a ratchet wrench without taking it off the screw head, as shown in the illustration. A square-head cap screw is shown at A, and the wrench B is constructed so it will have all the essential gripping parts of a common wrench, yet turn around on the screw head in making



Operates the Same as a Ratchet Wrench

the backward turn. Turn the wrench over and it will remove a screw in the same manner.—Contributed by C. Purdy, Ghent, O.

Caliper for Hexagons and Squares

The tool here described is a combination caliper used to determine the exact size that a certain piece of round stock will "hex" or square. It will give in a moment's time the exact size of the full square for a tap, having given the diameter of shank. In Fig. 1, C to C_1 is exact size across flats, of the square of the shank whose diameter is A to A_1. For tool-room work it is almost indispensable and is something any mechanic can make in spare moments, says a correspondent of the American Machinist.

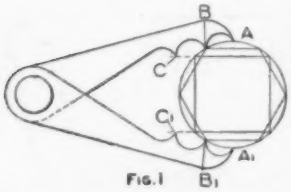


Fig. 1

Having determined the length of leg best suited to the work at hand, set a pair of sharp-pointed dividers to that measurement and describe (preferably on a sheet of tin) a circle as D-A-X-Y-Z, Fig. 2, with radius = OA, Fig. 3. Without changing the setting of the dividers, step off in the upper half of the circle, the half of the inscribed hexagon and connect these points with scribed lines as A-X, X-Y, Y-Z. Next lay off the sides of the inscribed square in the lower half of the circle as A-D, D-Z. Drop perpendiculars from the center O to the center of the sides of the inscribed hexagon OB and the square O C. These perpendiculars or distances from the center O are the measurements used, together with the radius OA, to ascertain the location of the points ABC and $A_1B_1C_1$ in the extended tool, Fig. 3.

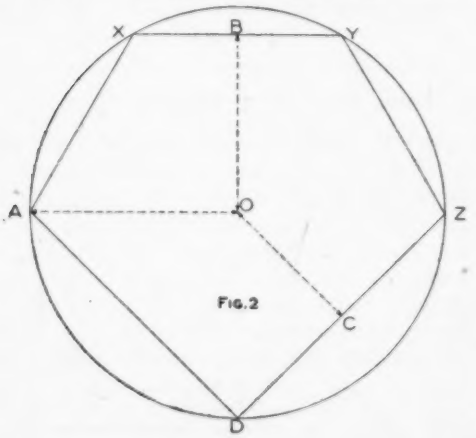


Fig. 2

Fig. 3
Layout of Tool

Care should be taken to have the three points A, B and C on each leg, all in a perfectly straight line from the outer point to the center of the pivot hole, as all six points should be in contact when the tool is closed.

To use it as in Fig. 1, set the outer points A and A_1 to the diameter of the work to be squared or "hexed" and the points B to B_1 will give the exact size the piece will "hex," while the points C to C_1 will give the size to which the piece will square.

To Harden a Hammer

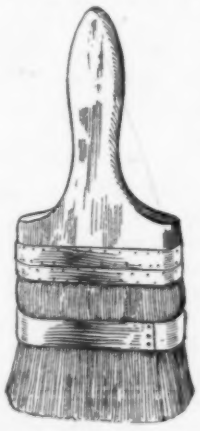
All hammers should be hardened on their striking faces only. As these are opposite each other and but a short distance apart, it would seem a difficult task, but in reality it is quite simple; the only difference from any other hardening and tempering job being that extra caution must be taken to prevent drawing the temper from the first face while heating the second. This can be done by filling the hammer eye with wet waste and keeping it wet, and by withdrawing the hammer from the fire occasionally and cooling the already tempered head in water. Thus the tempered head is kept cool and the heat confined to a short distance back from the second end or face. To temper, quench as you would with any chisel or tool, polish with emery cloth, and dip when the temper has drawn down to a light brown. Most authorities give 430° (light yellow) as the

proper color for hammer faces, but a majority of the present day hammers are softer than that, or about 450° (straw yellow). The ideal hammer is hard on the face only. The peen is usually made a little softer than the other face.

When you wish to do a first-class job of hardening of any kind, much better results will be obtained if the work is put in a piece of pipe or a special tube closed at one or both ends. The work will heat much more evenly and will come out of the fire perfectly clean and free from ashes. It will harden better, have a longer life and be much less liable to crack.—Contributed by D. A. Hampson, Middletown, New York.

Graduating the Stiffness of a Brush

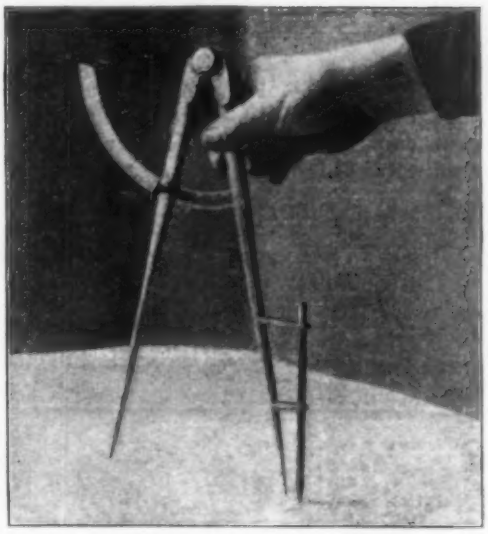
The bristles of a brush can be easily changed from stiff to soft by placing a tin band snugly around the brush part so it can be readily moved up or down as desired. The bristles can be graduated to any degree of stiffness by changing the location of the band. —T. L. P.



¶The makers of shade rollers do not put in enough tacks and especially so at the ends of the rollers. It is best to put in a few additional tacks to save the annoyance of having to re-tack the shade on the roller in case of careless handling which children often give them.

Combination Compass and Dividers

The compass shown in the accompanying photograph is made from an old buggy top brace. This compass will prove very handy in all classes of work where a great degree of accuracy is not required. The ends are cut off

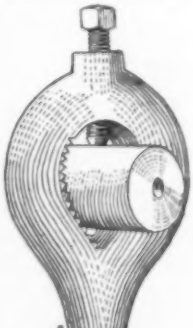


Made of a Buggy Top Joint

to the desired length and then pointed. This can be done by filing or by heating and hammering them out. A notch should be filed in one leg and a brass piece brazed in so as to form a slot for the circular arm. A hole should be tapped in this brass piece for the adjusting screw. Two arms can be brazed to the other leg for holding a pencil, if desired.—Contributed by J. W. Plemons, Circleville, Ohio.

Lathe Dog with a Notched Grip

This dog is nothing more than an ordinary lathe dog with teeth or notches cut in the inner surface of the opening. The notches make it possible to hold a shaft with only a slight pressure of the screw. A shaft as large as the opening can be turned in a lathe with this dog, using a pressure from the screw, produced by turning it with the fingers.—Contributed by Chester Purdy, Ghent, Ohio.



Measuring, Marking and Cutting Rafters

As a rafter is the long side or hypothenuse of a right angle triangle, the best way to find the length is to calculate it by mensuration and then mark

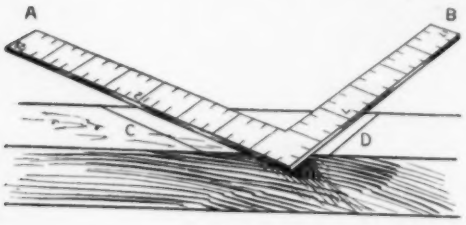


FIG. 1

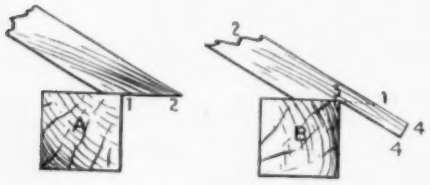


FIG. 2

Marking for Angles

each rafter at the proper angles for cutting. The length may be found by taking the square of the height of the roof, adding to it the square of one-half the width of the building, and extracting the square root of the sum. This will give the length. For example: suppose the height of the roof or gable is 6 ft. and the width of the building is 16 ft., then the square of 6 is 36, and 8 (one-half the width of the building) is 64; 36 plus 64 equals 100, and the square root of 100 is 10, which is the length of the rafter.

When the length is known, the following method may be used to mark the angles for cutting: If the roof is called a half pitch, the angle of cutting will be the same at each end, or 45 deg., and the rafters can be cut in a miter box and will fit regardless of which ends are placed together. Lay a square on the end of the rafter that is to rest on the plate of the building, as shown in Fig. 1. On the blade A let a figure represent one-half the width of the building and on the blade B let a proportionate figure represent the height of the gable. For instance, if the building is 24 ft. wide and the roof is to be 7 ft. high, lay the square with the figure 12 just to the edge of the rafter on the blade A and the figure 7 on the blade B. Make a pencil mark along the side of the blade as indicated by C. This will mark the proper angle for the lower end of the rafter. Move the square to the other end of the rafter and lay it down in the same manner and with reference to the same figures. Make a mark just outside of the blade B as indicated by D. This will be the upper angle for the top end of the rafter. This method gives the proper angle for each end of the rafter on any pitch of the roof. Always remember to have as many inches on the blade B as the roof is high in feet and as many inches on the blade A as half the number of feet the building is wide. Care must be taken to have the marks C and D the proper distance apart so that when the angles are cut the rafter will be the right length.

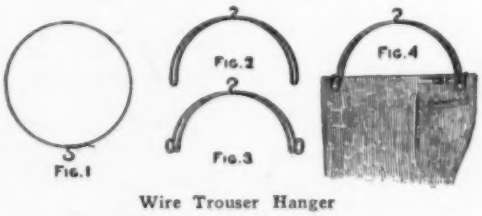
The length of the rafter and the marks for cutting can be done at the same time. This method saves calculating the length and does the measuring and marking in one operation. It will give the pitch of the roof approximately correct. While at certain pitches there may be a very slight difference in the height of the gable from what is expected, the rafters will always fit properly because they will be angled according to their strength. This method consists in laying the square as in Fig. 1, but at certain angles for different pitches, and moving the square along the rafter from mark to mark one-half as many times as the building is wide. When the square is laid on the first time, a mark is made along the side of the blade A. This mark will be the proper angle for the end of the rafter that sets on the building plate. Another mark is now made along the outside of the blade B and the square is moved along the rafter so

that the figure on A comes to this mark. This operation is done, as mentioned, one-half as many times as the building is wide in feet. The last mark made on the outside of the blade B will be the mark for cutting the top end of the rafter. When the square has been laid on the rafter the required number of times it is evident that the first and last marks will agree with the marks C and D, as shown in the illustration, and will be the proper angles and length for cutting the rafter.

The assumed projections of the opposite rafters must be taken in consideration and counted in on the width of the building to obtain the right figure to make the rafters fit properly. If the rafters are to be set on the plate as in A, Fig. 2, the width of the building must be taken from the point 2 instead of 1, and if they are set as in B, the length of the rafter must be measured from the point 1 and the width of the building taken from 1 instead of 3. The part from 1 to 4 and from 3 to 4 is regarded as an appendage—Contributed by J. G. Allshouse.

How to Make a Trouser Hanger

The hanger is made of a piece of heavy wire about 4 ft. long bent so as to form a complete circle with a hook made on one end and the other twisted about the wire at the base of the hook to hold them together, as shown in Fig. 1. The wire is then bent double, Fig. 2, and the ends turned up, Fig. 3, to make hooks for the buttons. The



Wire Trouser Hanger

spring of the wire will keep the waist band tight. The method of application is shown in Fig. 4.—Contributed by Herbert Hahn, Chicago, Ill.

Keying Foundation Timbers

There are three ways of keying one timber crosswise to another, as, for instance, in making a temporary or semi-permanent foundation for a saw-mill or other machinery, says Power and Transmission.

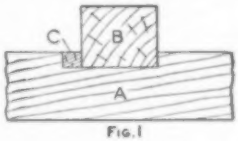


Fig. 1

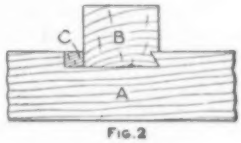


Fig. 2

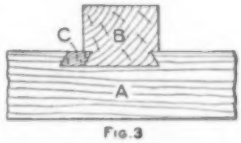


Fig. 3

The first is shown in Fig. 1, where the sill A is simply boxed out a bit wider than the cross-tie B, and the wedge or key C is rectangular. The objection to this, which of course is the easiest way, is that the tie B can lift, unless the weight upon it is very great and it can tip, if there is any great cross thrust.

The lifting tendency is very largely overcome by making a dovetail on one side of the gain in the sill, as seen in Fig. 2. This prevents tipping to the left as seen in the sketch, but not to the right.

The best way, however, is to make the box in the sill a full dovetail, as seen in Fig. 3, and to use a rhomboidal wedge, as shown at C in the same figure. Several of these wedges can be made economically by taking a piece of wide plank, as long as the wedges are to be, and canting the saw table so as to cut it on the bevel.

Converting Quicksand into Rock

Quicksand can be made into a solid rock and save the driving of piles where it is desired to secure a good strong and lasting foundation for bridges, buildings or machinery. Take a hand or power force pump and a long pipe nozzle, and inject liquid cement into the quicksand. One bag of cement will solidify 7 cu. ft. of quicksand.

Air Lock for Boats

Air Lock on the Side of a Boat

To make a useful and efficient air lock for boats take a board about 3 ft. long, nail ends and one side to it, and fit it to the side of the boat. Make two of them, one for each side of the boat and fasten them a little above the waterline. Fasten them securely and calk with tar. With these attached, the air caught in the lock will prevent a boat from upsetting.

Finding the Gradient of a Hill

Many motorists may have wished at some time or other to find out the gradient of some hill in their neighborhood, says Automobile Topics. This can be readily done with the assistance of a level and a piece of straight timber—a lath will do. First run the car on a perfectly level floor and have the tires all pumped up to normal. The footboard should be made parallel with the floor, that is, horizontal. Obtain a piece of lath, ½ in. thick, 2 in. wide and 5½ ft. long, and have the edges planed true and straight. Fasten a small piece of wood firmly at right angles on one end of this lath. The piece should extend 2½ or 3 in. below

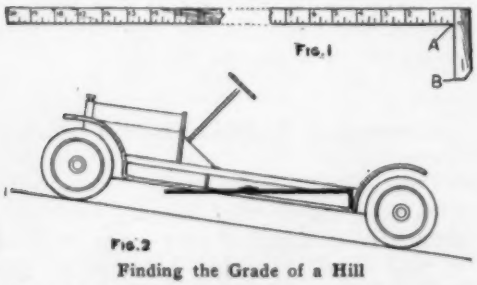


FIG. 1

FIG. 2

Finding the Grade of a Hill

the edge of the long piece. Along the bottom edge of the long arm mark off at a number of points the exact distance apart that the short arm projects below the long arm, or from A to B.

If the short arm projects 3 in., a 5-ft. long arm will give twenty readings. These can be again subdivided into as many parts as the accuracy desired may require. With this simple affair and an ordinary level, take the car to the center of the slope you wish to measure. Stop on the slope, stand the short arm on the edge of the footboard near the rear wing, Fig. 2. Place the level on top of the long arm, and when the long arm is moved to be exactly horizontal, read off the figure of the division cutting the rear edge of the footboard. This gives the slope, expressed as a fraction, viz., 1-20, 1-14, 1-17½, etc. This operation can be repeated on every change of slope, and if the surface distance between each change of slope be taped, the section of the hill can be easily plotted. If it be desired to express the slopes thus found in degrees, sufficient accuracy is obtained up to 20 deg. by dividing the denominator of the fraction into 60. Thus, a slope of ¼ equals 15 deg., 1/6 equals 10 deg., 1/8 equals 7½ deg., all approximate.

Add aluminum bronze to a white or light paint that is to be used for lettering on a dark ground.

AMATEUR MECHANICS

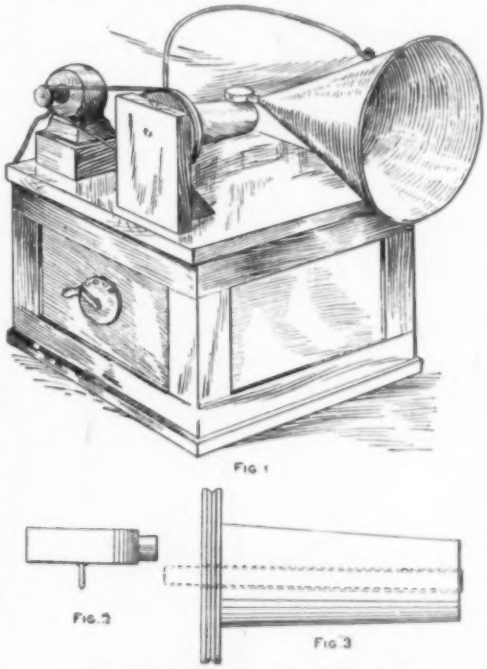
Home-Made Phonograph

Make a box large enough to hold four dry cells and use it for a base to mount the motor and a support for the revolving cylinder. Any one of the various battery motors may be used for the power. The support for the cylinder is first made and located on the cover of the box in such a position that it will give ample room for the motor. The motor base and the support are fastened by screws turned up through the cover or top of the box. The location of these parts is shown in Fig. 1.

The core for holding the cylinder wax records is made of wood, turned a little tapering with a diameter at the small or outer end of 1⅝ in., and the larger end 1⅞ in., the length being 4½ in. A wood wheel with a V-shaped groove on its edge is nailed to the larger end of the cylinder. The hole in the core is fitted with a brass tube, driven in tightly to serve as a bearing. A rod that will fit the brass tube, not too tightly, but which will not wobble loose, is threaded and turned into the upper end of the support. The core with its attached driving wheel is shown in Fig. 3. The dotted lines show the brass bearing and rod axle. The end of the axle should be provided with a thread over which a washer and nut are placed, to keep the core from coming off in turning.

The sound box, Fig. 2, is about 2½ in. in diameter and 1 in. thick, made of heavy tin. The diaphragm, which should be of thin ferrotype tin, should be soldered to the box. The needle is made of a piece of sewing needle, about ⅛ in. long, and soldered to the center of the diaphragm. The first point should be ground blunt, as shown in the sketch. When soldering these parts together, take care to have the diaphragm lie perfectly flat and not made warping by any pressure applied while the solder is cooling.

The tin horn can be easily made, attached to the sound box with a piece of rubber hose and held so it will swing the length of the record by a rod attached to the top of the box as shown. The motor can be controlled by a small three or four-point battery rheostat.—Contributed by Herbert Hahn, Chicago, Ill.

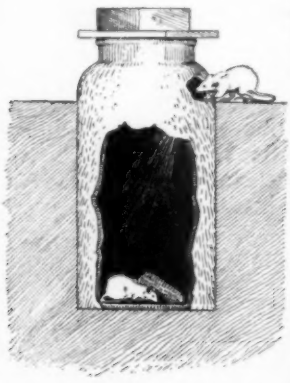


Phonograph and Construction of Parts

¶ Glass doors in bookcases may be kept from swinging open by boring a hole about ¼ in. deep either at the top or bottom in the edge of the door, 2 in. from the closing edge, and inserting an ordinary cork, allowing a small portion to project and rub on the facing.

A Novel Rat Trap

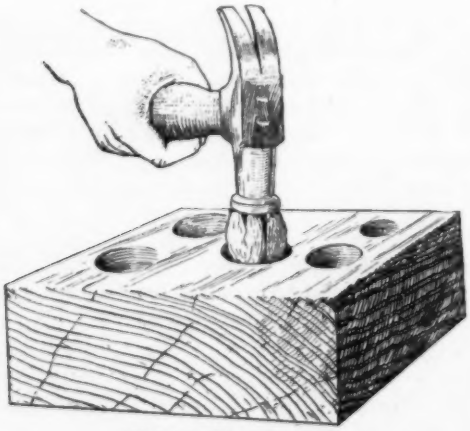
A boy, while playing in the yard close to a grain house, dug a hole and buried an old-fashioned fruit jug or jar that his mother had thrown away, says the Iowa Homestead. The top part of the jug was left uncovered as shown in the sketch, and a hole was broken in it just above the ground. The boy then placed some shelled corn in the bottom, put a board on top, and weighted it with a heavy stone.



The jug had been forgotten for several days when a farmer found it, and, wondering what it was, he raised the board and found nine full-grown rats and four mice in the bottom. The trap has been in use for some time and is opened every day or two and never fails to have from one to six rats or mice in it.

A Nut-Cracking Block

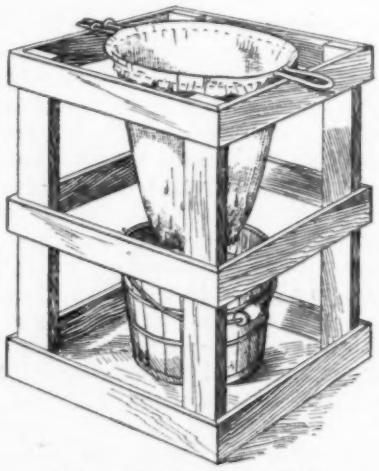
In the sketch herewith is shown an appliance for cracking nuts which will prevent many a bruised thumb. To anyone who has ever tried to crack butternuts it needs no further recommendation. The device is nothing more than a good block of hardwood with a few holes bored in it to fit the different sized nuts. There is no need of holding the nut with the fingers, and as hard a blow may be struck as desired. Make the depth of the hole two-thirds the height of the nut and the broken pieces will not scatter.—Contributed by Albert O'Brien, Buffalo, N. Y.



Holes in Block for Nuts

A Jelly-Making Stand

Every housewife who makes jelly is only too well acquainted with the inconvenience and danger of upsets when using the old method of balancing a jelly-bag on a couple of chairs stood on the kitchen table, with the additional inconvenience of having a couple of chairs on the kitchen table out of commission for such a length of time.



Cheesecloth Strainer on Stand

The accompanying sketch shows how a stand can be made from a few pieces of boards that will help jelly makers and prevent the old-time dangers and disadvantages. The stand can be stood in the corner of the kitchen, or under the kitchen table where it will be out of danger of being upset.—Contributed by Lyndwode, Pereira, Ottawa, Can.

Wood-Working for Beginners

By IRA S. GRIFFITH

CHAPTER VII—Squaring up Mill-Planed Stock

Guaging for Width

Having planed and marked the face side and face edge, the next step is to mark the desired width. Figure 36 shows the tool used for this purpose and the manner of holding it while setting it. It is called a marking gauge. Gauge sticks are marked off like a ruler into inches and fractions. These markings are so unreliable, however, that it is better not to depend upon them. Figure 37 shows the position of the gauge in action. The top of the spur is tipped forward so as to make the cutting edge enter the wood at a slight angle while the tool is being pushed

Fig. 36—Holding and Setting Marking Gauge

forward. The head of the gauge must be held against the face edge.

Planing Second Edge

The second edge is planed in a manner similar to that of the first. The gauge line limits the amount of wood that may be removed. Care must be taken, therefore, to test with the try-square as was done on the first edge while approaching the line, so that any irregularities may be corrected by the time the line is reached.

The test for straightness such as was given the first edge is not necessary here, if the gauge line has been planed properly. The first edge being straight and the second one gauged therefrom, the second edge will be straight too if the gauging has been carefully done. If there is more than

Fig. 37—Gauging for Depth

one-fourth of an inch of waste outside the gauge line it should be ripped off, cutting parallel to the line and about $\frac{3}{16}$ in. in the waste.

Planing Second Surface

Since stock that is S-2-S has the correct thickness, it is necessary in preparing this surface merely to remove the mill-marks, the smoothing plane

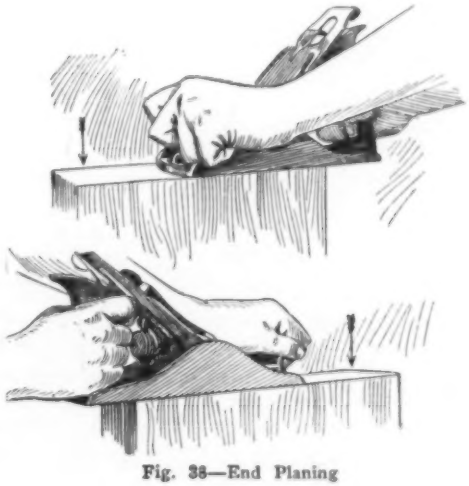


Fig. 38—End Planing

being used as described in planing up the first broad surface.

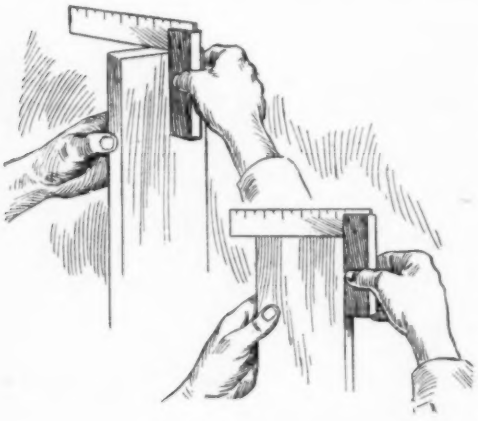


Fig. 39—End Testing

Planing First End

End planing differs from edge and surface planing in that there are no shavings, only sawdust, because the cutting takes place across the grain. Care must be taken in end planing not to sliver and break the arrises. This can be avoided by not planing entirely across the end. Plane about two-thirds of the way, then reverse and plane from the other direction (Fig. 38).

While the block plane is especially designed for doing end planing, any of the other planes may be used if a vise is at hand in which the piece of wood may be placed so as to allow both hands free for holding the plane.

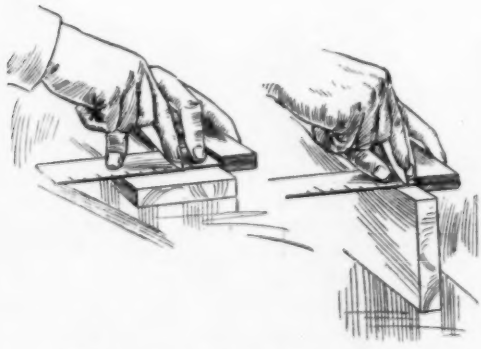


Fig. 41—Lining across Edge and Face

THE TESTS—The first test for accuracy in end planing is made by holding the beam of the try-square firmly against the face edge and lowering the blade until it rests upon the end of the piece of wood. By holding the piece up between the light and the eye any unevenness will be visible (Fig. 39). The second test is similar to the first except that the beam of the try-square is held against the face side instead of the face edge. Continue planing until both tests show no light between the try-square blade and the end of the wood.

Measuring the Length and Lining

From the end just squared up measure and mark the length desired, Fig. 40. With try-square and knife mark lines (Fig. 41) at this point across face side and face edge. If there is more than ⅛ in. of waste, saw it off, sawing

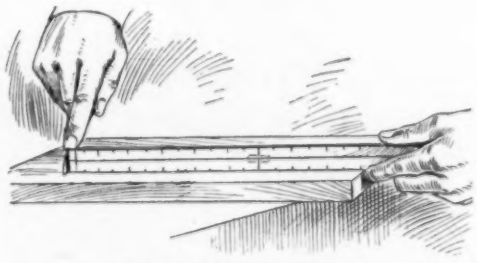


Fig. 40—Measuring Length

about $\frac{1}{16}$ in. outside and parallel to the line.

Planing Second End

The second end is to be planed to the lines just made. The two tests given the first end should be applied to the second end while approaching the lines; that the end may be square when the lines are reached.

This completes the squaring up of stock mill-planed to correct thickness.

(*To be Continued.*)

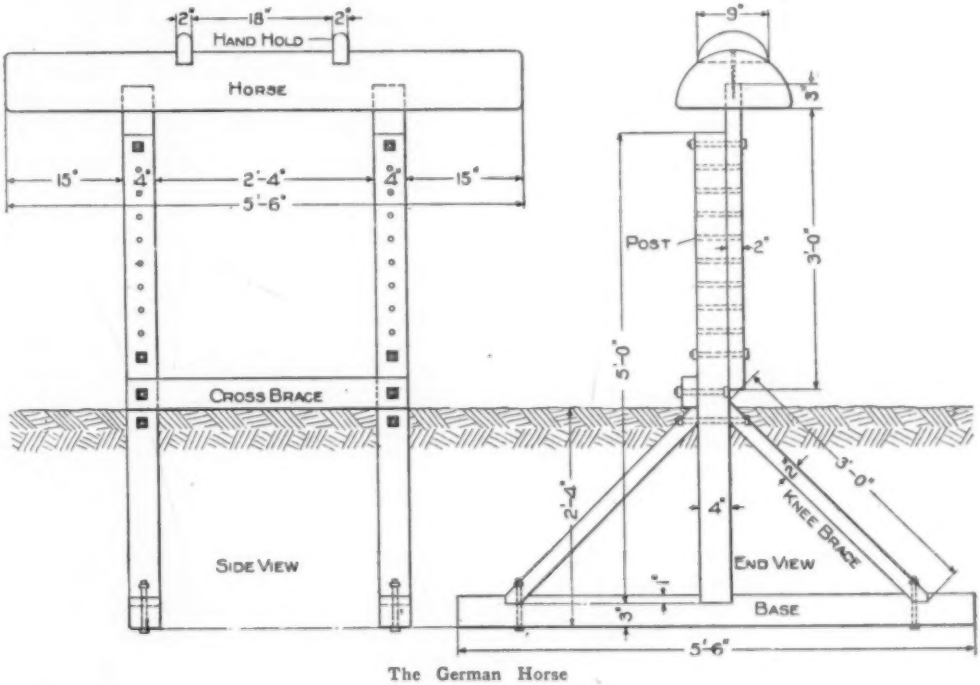
¶A piece of red string, tied to the positive wires in an ignition system, will save time and trouble.

An Outdoor Gymnasium

PART III—The Horse

The German horse is that peculiar piece of apparatus which is partly a horizontal obstruction to leap over, partly a barrier for jumps, partly a smooth surface of long and narrow dimensions over and about which the body may slide and swing, and partly an artificial back for the purpose of a peculiar style of leap frog.

The round part of this log must be planed, scraped and sandpapered until it is perfectly smooth, and free from knots, projections and splinters. Hand holds must be provided next. These are placed 18 in. apart in a central position on the horse. Make two parallel saw cuts 2 in. apart, straight down in the round surface of the horse until



The German Horse

To make a horse for the outdoor "gym" requires no difficult work save the preparation of the top or body of the horse. The making of the regular gymnasium horse requires a very elaborate wood-working and leather upholstering plant, but the one used for outdoor work can be made of a log of wood. Procure from a saw mill, wood yard or from the woods, one-half of a tree trunk from a tree 9 to 15 in. in diameter—the larger the better. The length may be anywhere from 4 to 7 ft., but 5½ ft. is a good length.

each cut is 9 in. long. Chisel out the wood between the cuts and in the mortises thus made insert the hand holds. Each hand hold is made of a 9-in. piece of 2 by 4-in. stud cut rounding on one edge. These are well nailed in place.

The body of the horse is to be fastened on top of posts so that it may be adjusted for height. It is not as difficult to make as the horizontal and parallel bars. The material required is as follows: Two posts, 4 in. square by 5 ft. long; 2 adjusting pieces, 2 by 4 in. by 3 ft. 3 in. long; 1 cross brace,

2 by 4 in. by 3 ft. long; 2 bases, 4 in. square by 5½ ft. long; 4 knee braces, 2 by 4 in. by 3 ft. long; two ½-in. bolts, 9 in. long, to fasten the knee braces at the top; ten ½-in. bolts, 7 in. long, 4 to fasten the knee braces at the bottom, 2 to fasten the cross brace and 4 to be used in fastening the adjusting pieces to the posts.

To construct, lay out the bases as shown in the drawing, making the mortises to receive the bottom ends of the posts exactly in the center, and cut a slanting mortise 6 in. from each end to receive the ends of the knee braces. Bevel the ends of the knee braces and fasten the upper ends of each pair to the post with one 9-in. bolt. Fasten the lower ends to the base with the 7-in. bolts.

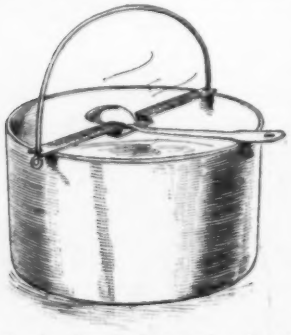
The upper end of each post should have ⅝-in. holes bored through it parallel to the base at intervals of 3 in., beginning 1½ in. from the top and extending down its length for 2 ft. 4½ in. The adjusting pieces are to be bored in a similar manner after which they are to be mortised into the under side of the horse top 15 in. from each end, and secured with screws put through the top and into the end of the adjusting pieces.

The bases with their posts and knee braces are buried 2 ft. 4 in. in the ground, parallel to each other and the same distance apart as the adjusting pieces are mortised in the horse top. When the ground has been filled in and tamped hard, the cross brace should be bolted in position with its lower edge resting on the ground and connecting the two posts.

The height of the horse from the ground is adjusted by changing the bolts in the different holes connecting the two adjusting pieces with the two posts. Much pleasant and healthful gymnastic exercise can be had in competitive horse jumping and leaping, the handles providing a way to make many different leaps through, over and around, including not only those made to see who can go over the horse from a standing or running start at the greatest height, but who can go over at the greatest height when starting from the "toeing off mark" farthest away from the horse. This horse should be located on level ground having smooth space about it for several feet.

Spoon Rest for Kettles

A rest for keeping spoons from slipping into kettles can be made from a strip of metal bent as shown in the illustration. The spring of the metal will make it easy to apply to the kettle. The spoon placed in the rest will drain back into the kettle. The cover can be placed on without removing the spoon.—Contributed by W. A. Jaquythe, Richmond, Cal.



Reason for Bursting of Gun Barrels

Gun barrels do not burst without a cause and usually that cause is one of which the shooter is entirely ignorant, but nevertheless, no one is responsible but himself, says the Sporting Goods Dealer. Gun barrels can only burst by having some obstruction in the barrel or by overloading with powder. Any gun barrel can be burst by misuse or by carelessly loading smokeless powder, but no barrel will burst by using factory loaded ammunition, provided there is no obstruction or foreign substance inside the barrel. When a gun barrel bursts at the breech or chamber, it is caused by an overloaded shell, and when it bursts in the center or near the muzzle, it is caused by some obstruction, such as a dent, snow, water, etc.

How to Make a Wireless Telegraph Set—Part IV

By Arthur Moore

Spark Coil Construction

In order to use your spark coil for experimental and wireless work you will need some form of a spark gap. A very simple one, that can be mounted in the plates attached to the top of the containing case of the coil, can be made as follows:

Procure two pieces of $\frac{5}{16}$-in. brass rod, each about 5 in. long, and thread both ends to a distance of about ¼ or $\frac{5}{16}$ in. Now turn from some hard wood two pieces similar to the one whose cross-section is shown in Fig. 1. These pieces should have a $\frac{5}{16}$-in. hole drilled through them and the brass rods forced into the holes, the rods being held in place by a small brass pin, P, placed in a hole drilled through the brass and wood as shown in Fig. 1. Obtain two brass balls about 1 in. in diameter. Drill a $\frac{5}{16}$-in. hole through each of them. At a right angle to this hole drill a second hole half way through ¼ in. in diameter, and the remainder of the way ⅛ in. in diameter. Tap the larger end of this hole so the balls can be screwed on the ends of the brass rods. The smaller end should also be threaded or a small piece of brass rod with threaded end soldered into it that can be used in mounting a binding-post as shown in Fig. 2. Obtain two pieces of $\frac{5}{16}$-in. brass rod each about 7 in. long. Turn from some hard wood two handles as shown in Fig. 3. Drill a $\frac{5}{16}$-in. hole in the small end of these handles to a depth of at least 1 in. and force the brass rods in place. The other end of the brass rods should be threaded for a short distance. These rods can be passed through the openings in the balls and held in place by means of a set screw, S, as shown in Fig. 4. The spark gap proper can be adjusted by moving one or both of these rods. Small brass balls or pieces of zinc can be screwed on the threaded ends of the rods to form the terminals of the gap.

The spark coil is now complete with the exception of an interrupter for the primary circuit. It is impossible to use the ordinary alternating current in the primary as its frequency is too low to produce the required number of reversals in the secondary. There are three different types of interrupters that are used in wireless telegraph circuits. These are the electrolytic, the mercury, and the vibrating spring types.

The electrolytic interrupter consists of a vessel containing a solution of dilute sulphuric acid with two terminals immersed in this solution. The positive terminal or anode is made of platinum and should have a surface of about $\frac{3}{16}$ in. The negative terminal or cathode is made of lead and should have an area of something like 1 sq. ft. When this interrupter is connected in series with the primary of an induction coil and a source of electromotive force of about 40 volts, the circuit will be interrupted, due to the formation and collapse of bubbles on the platinum electrode.

The mercury interrupter, which is no doubt the one most commonly used in commercial wireless stations, is capable of making interruptions as high as 10,000 per second. This interrupter consists of an iron vessel with a vertical steel shaft mounted in it and arranged to be driven at a very high speed by a small motor. Attached to this spindle is small worm or centrifugal pump. Above this pump there is mounted on the shaft a small nozzle that is connected to the outlet from the pump. When the spindle is rotated the mercury is raised to the nozzle and thrown outward against the side of the vessel.

There is mounted in the side of the vessel a small insulated piece of metal which forms one terminal of the circuit that is to be interrupted, while the iron vessel forms the other terminal. By varying the length of the insulated

segment and the speed of the shaft, the number of interruptions can be adjusted to the desired value.

The vibrating spring type of interrupter is no doubt familiar to almost every one, it being practically the same as the ordinary vibrating bell. Its operation is very satisfactory when properly constructed and adjusted.

The construction of the mercury interrupter is rather difficult and the electrolytic interrupter requires 40 volts or more to operate it so that you had better construct the vibrating spring type.

The principle of the spring interrupter is shown in Fig. 5. When a current is passed through the circuit by connecting a battery or some other source of electromotive force to the terminals T_1 and T_2, the iron core I of the coil C becomes magnetized and attracts the soft iron armature A, which is mounted on the spring S. When this armature A is drawn toward the iron core I the contact K is broken and the core of the coil C becomes demagnetized, due to the fact that no current is flowing in the circuit, thus allowing the armature A to return to its initial position and again complete the contact K, and the same operation is again gone through. The winding C may be the primary winding of the spark coil or it may be an entirely different winding as shown in Fig. 6, the make and break contact for the primary circuit being an additional one mounted on the spring S, as shown at K_1. This second type of construction has the advantage that it can be used with any coil, while the other type is mounted rigidly to one particular coil.

The following description is that of a vibrator as shown in Fig. 5, with a little change, and will serve your purpose. All the care that you may exercise in the construction of your coil will give results far below those anticipated, if the vibrator is of poor design. The simple vibrator shown in Fig. 6 should have the following modification to make its operation the best. The make and break contact is not mounted upon the main spring S, but upon a second spring S_1 whose movement is controlled by S through the screw H, Fig. 8. This screw H passes through a hole in S_1 a little larger in diameter than the screw itself and screws into S. With this arrangement the division of the time between the make and break of the circuit is better made.

First procure some ⅛-in. brass and cut a piece to correspond to the dimensions given in Fig. 7. Drill the holes in this piece as indicated. Bend the part P at the dotted line until it is at right angles to the remainder of the piece.

Procure a piece of spring brass, 3⅛ in. long, 1 in. wide and $\frac{1}{32}$ in. thick, that is to form the spring S, Fig. 8. Round off the upper end of this piece and drill the holes as indicated in Fig. 9. The spring S_1 should be made from some spring brass 1/64 in. thick and its other dimensions should corrrespond to those given in Fig. 10. Drill the holes indicated in the figure and fasten a small piece of platinum in place at the point K.

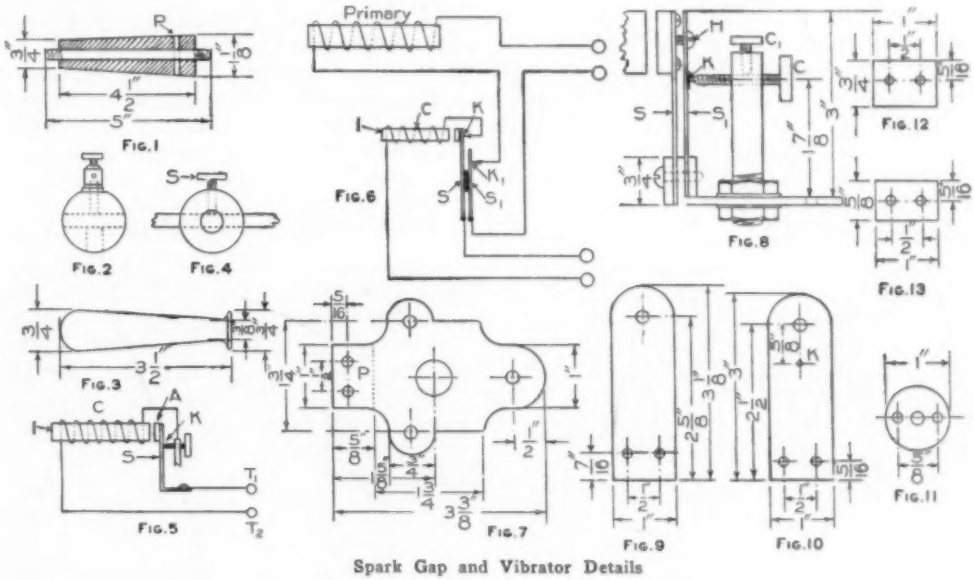
Cut from a round bar of soft iron, 1 in. in diameter, a piece ¼ in. long and drill three holes in it as shown in Fig. 11. These holes should be threaded to take machine screws. This piece can now be mounted on the upper end of the spring S with two small screws.

Cut two pieces from some ⅛-in. brass whose dimensions correspond to those given in Fig. 12 and Fig. 13. Tap the two holes in the piece shown in Fig. 12. These two pieces are to be used in mounting the springs S and S_1 upon the base of the vibrator as shown in Fig. 8.

The support for the screw C, Fig. 8, can be made from some ½-in. brass rod. Take a piece 2¾ in. long and thread one end for a distance of ¾ in. Drill a hole ¼ in. from the other end and thread it to take the screw C which should be about $\frac{3}{16}$ in. in diameter. Drill a second hole in the end of the rod and thread it to take the screw C_1, Fig. 8, that is to hold C in place after it is once adjusted. Another hole should be drilled in the threaded end of the rod

and a piece of No. 14 gauge copper wire about 12 in. long soldered into it to be used in making connections to the vibrator. Make two nuts $\frac{3}{16}$ in. thick to fit the thread cut on the rod, one rubber bushing to fit the large hole in the base of the vibrator with an opening in it ½ in. in diameter, and two washers of insulation material, 1 in. in diameter and $\frac{1}{16}$ in. thick with openings in them ½ in. in diameter. The support for C can then be fastened to

Assuming that all connections have been made as directed and that the construction of the various parts is complete, you can make the final adjustment as follows: Connect 12 dry cells in series to the posts B_5 and B_6. Adjust the spark gap to about ½ in. and the condenser to maximum capacity. Turn the screw C up until it completes the circuit and the vibrator is started. You should now vary the tension in the screw H, the position of the screw C



Spark Gap and Vibrator Details

the base as shown in Fig. 8. The vibrator is now complete and can be mounted on the case of the coil. A small wooden block should be provided of sufficient thickness to place the armature A on the same level as the end of the core of the coil. Place the end of a piece of No. 14 gauge copper wire under one of the screws used in mounting the base, and pass it through a hole in the top of the lower case, and solder the other end to the binding-post B_3. (See Fig. 7, Part III.) The wire that was soldered to the support for C should also be soldered to the binding-post B_4. The primary winding is connected to the binding-posts B_5 and B_3. The condenser can be connected across the contact of the vibrator by short pieces of wire as previously described.

and the capacity of the condenser until you obtain the maximum spark. This adjustment is a matter of trial, becoming easier as you operate your coil.

(To be Continued.)

How to Remove Glass Stoppers

Glass stoppers often stick in decanters and are very hard to remove. They can be withdrawn easily by winding a string several times around the neck of the bottle, then by taking hold of the loose ends, and drawing the string rapidly back and forth. The friction caused by the string will heat the glass and cause it to expand, thus releasing the grip on the stopper.—Contributed by A. A. Houghton.

Telescope Stand and Holder

With the ordinary small telescope it is very difficult to keep the line of sight fixed upon any particular object. To meet the situation I constructed the device illustrated herewith. A circular piece of wood, B, 6 in. in diameter, is fastened to a common camera tripod, A, with a set screw, S. Corner irons, CC, are screwed to the circular piece. These corner irons are also screwed to, and supported in a vertical position by the wood standard D, which is 4 in. wide and of any desired height. To this standard is secured the wood shield-shaped piece E by the screw G upon which it turns. A semi-circular slit is cut in the piece G, through which passes the set screw S. The telescope is secured to the piece G by means of the pipe straps FF. Rubber bands are put around the telescope to prevent rubbing at the places where the straps enclose it.

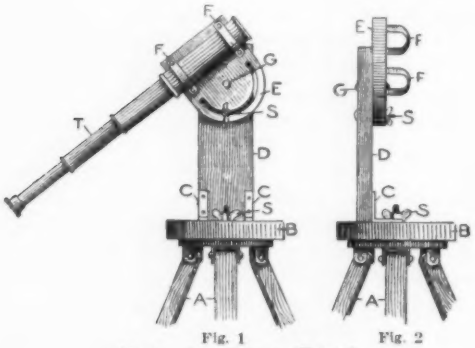


Fig. 1

Fig. 2

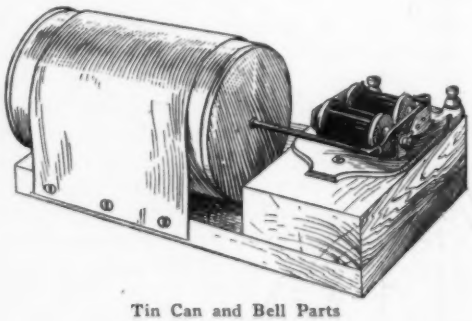
Made of a Camera Tripod

The wood pieces were made of ½-in. mahogany well rubbed with linseed oil to give them a finish. The corner irons and set screws or bolts with thumb-nuts can be purchased at any hardware store. The pipe straps of different sizes can be obtained from a plumber's or gas and steam fitter's store. With this device, either a vertical or a horizontal motion may be secured, and, after bringing the desired object into the line of sight, the set screws will hold the telescope in position. Any one owning a tripod can construct this device in three or four hours' time at a trifling cost. In Fig. 1 is shown the side view of the holder and stand, and Fig. 2 the front view.

It may be of interest to those owning telescopes without solar eyepieces to know that such an eyepiece can be obtained very cheaply by purchasing a pair of colored eyeglasses with very dark lenses and metal rims. Break off the frame, leaving the metal rims and nibs at each end. Place these over the eyepiece of the telescope and secure in place with rubber bands looped over the nibs and around the barrel of the instrument.—Contributed by R. A. Paine, Richmond, Va.

How to Make an Electrical Horn

Secure an empty syrup or fruit can, any kind having a smooth flat bottom will do. If the bottom is not perfectly flat, it will interfere with the regular tone vibrations, and not produce the right sound. Remove the label by soaking it in hot water. Take an ordinary electrical bell and remove the gong, clip off the striking ball and bend the rod at right angles. Cut a block of wood ¾ in. thick, 5 in. wide and 8 in. long for the base. Fasten the can on it with a piece of sheet brass or tin as shown in the sketch. Mount the bell vibrator on the base, using a small block of wood to elevate it to the level of the center of the can, and solder the end of the vibrator rod to the metal.

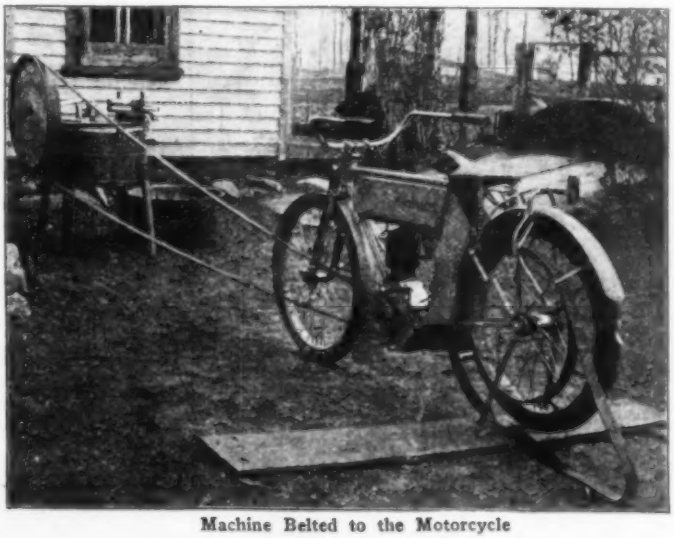


Tin Can and Bell Parts

Connect two dry cells to the bell vibrator, and adjust the contact screw until a clear tone is obtained. The rapidly moving armature of the bell vibrator causes the bottom of the can to vibrate with it, thus producing sound waves. The pitch of the tone depends on the thickness of the bottom of the can. This horn, if carefully adjusted and using two cells of dry battery, will give a soft pleasant tone that can be heard a block away. If the two projecting parts of the vibrator are sawed off with a hacksaw, it can be mounted on the inside of the can. This will make a very compact electric horn, as only the can is visible.—Contributed by John Sidelmier, La Salle, Ill.

Driving a Washing Machine with Motorcycle Power

The halftone illustration shows how I rigged up my washing machine to be driven by the power from my motorcycle. I made a wheel 26 in. in diameter of some 1-in. pine boards, shrunk an iron band on it for a tire, and bolted it to the wheel on the washing machine. A long belt the same width as the motorcycle belt was used to drive the machine. The motorcycle was lined up and the engine started, then the motorcycle belt thrown off and the long belt run on, connecting the engine and washing machine wheel. —I. R. Kidder, Lake Preston, S. D.



Machine Belted to the Motorcycle

Home-Made Aquarium

A good aquarium can be made from a large-sized street lamp globe and a yellow pine block. Usually a lamp globe costs less than an aquarium globe of the same dimensions. Procure a yellow pine block 3 in. thick and 12 in. square. The more uneven and twisted the grain the better for the purpose, as

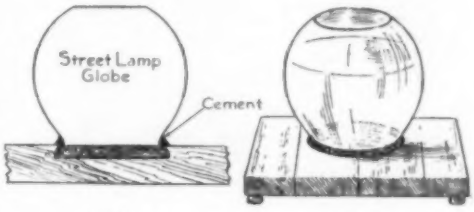


Fig. 1 Fig. 2

Lamp Globe as an Aquarium

it is then less liable to develop a continuous crack.

Cut out a depression for the base of the globe as shown in Fig. 1. Pour in aquarium cement and embed the globe in it. Pour more cement inside of the globe until the cement is level with the top of the block. Finish with a ring of cement around the outside and sprinkle with fine sand while the cement is damp. Feet may be added to the base if desired. The weight of the pine block makes a very solid and substantial base for the globe and renders it less liable to be upset.—Contributed by James R. Kane, Doylestown, Pa.

¶Never allow lard oil to harden on a lathe.

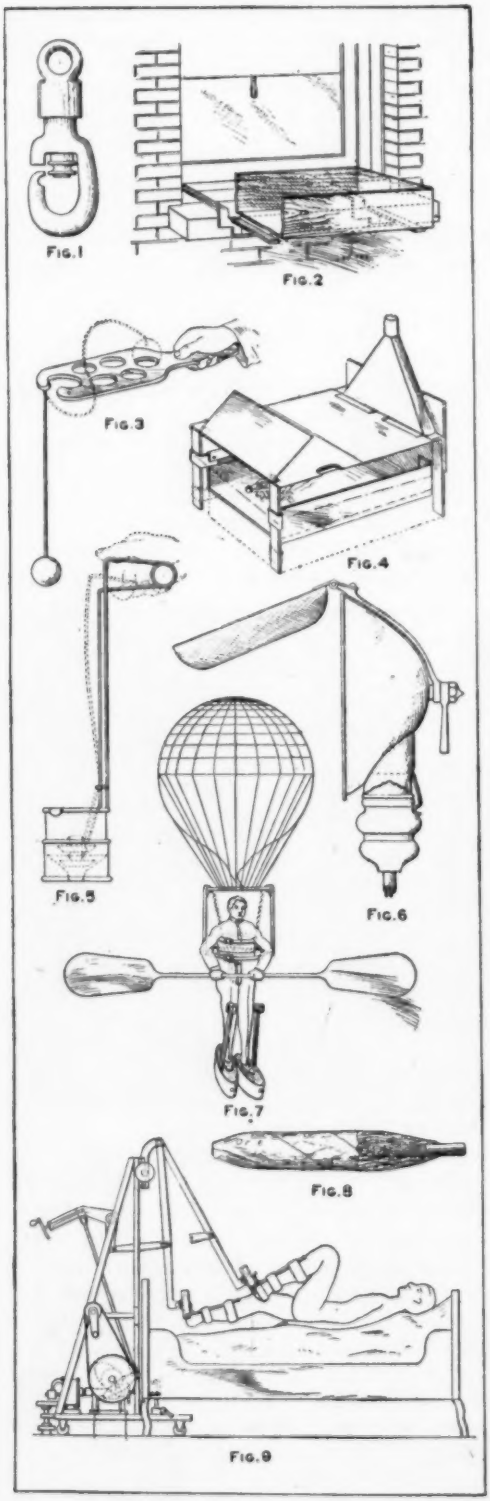


Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

INTERESTING PATENTS,

COMBINED SNAP-HOOK AND SWIVEL—Figure 1 is an interesting combination of snap-hook and swivel. It consists of a hook having its mouth on one side and a tubular shank at one end. The grooved roller, mounted on a stem which rotates in the shank, guards the mouth of the hook.

WINDOW-BOX SUPPORT—The problem of securely fastening window-boxes to stone window ledges is often hard to solve, but with this bracket device (Fig. 2) it becomes very simple. The inner ends of the brackets are screwed fast to the wooden sill.

PERFORATED-PADDLE BALL GAME—The object of this perforated-paddle ball game (Fig. 3) is to toss the ball on the end of its rubber leash in such manner as to land it in one of the holes provided. The largest count is gained by first succeeding in jerking the ball up through the hole at the end of the paddle and then depositing it in one of the other holes.

FOLDING CAMP STOVE—Figure 4 illustrates a camp stove that can be folded up for transportation purposes and carried in a small space. The firebox is removable and adjustable to the legs supporting the top of the stove. The legs are removable from the top piece, as are also the wind shield shown at the front and the stovepipe base at the rear.

COMBINED DIPPER AND FUNNEL—Transferring liquids from pots, pans, or tanks, usually requires two implements, a dipper and a funnel, but this arrangement (Fig. 5) combines the two in one. A valve at the lower end of the plunger seats over the discharge hole when dipping, but when the plunger is lifted this valve allows the liquid to fall through.

COMBINED REFLECTOR AND SHADE—Many kinds of intricate work require a strong reflector, yet the eyes must not be blinded with the glare. Consequently, the reflector shown in Fig. 6 is provided with a shade that not only protects the eyes but aids in throwing a powerful stream of light downward upon the object being worked upon. It is adjustably mounted so that it can be swung downward or to either side, the whole forming a double reflector.

UNIQUE BALLOON-FLYING-MACHINE—In the past, when aerial flight was still a dream, such ideas as the one here illustrated (Fig. 7) were put forth as solutions of the problem, but today, when aerial flight is a fact, machines of this order seem out of place. The means of buoyancy are a balloon, and auxiliary buoyant bodies located just under the feet. The operator stands or hangs upright, supported by a sling and saddle. Propulsion is by means of a double-ended paddle.

SMOKE FILTER FOR CIGARS—In this day of filtering and sterilization it is not unnatural that such a unique idea as this for the removal of the impurities from tobacco smoke has been given birth. The filter which is shown in Fig. 8, is formed of layers of blotting paper and cotton texture, provided with an envelope of water-proof paper. It is inclosed in the end of the cigar when the latter is rolled, and all the smoke drawn into the mouth passes through it.

MOVEMENT-CURE APPARATUS—The belief that compulsory movement of the limbs, when the patient is too weak to exercise them without aid, is a great help in effecting a cure in certain diseases or under certain conditions, has led to the designing of the apparatus illustrated by Fig. 9. The patient's lower limbs are made fast to the oscillating arms of the apparatus, which are operated at any speed desired by the turning of a crank.

SWEAT SHIRT FOR HOT WEATHER WEAR—This remarkable openwork shirt (Fig. 10) is an undergarment for exceedingly warm weather, or for men employed in high temperatures during any period of

PRACTICAL OR UNIQUE

the year. It consists of strips arranged in network form, with pieces of cork passing through and protruding from each side. These regularly spaced corks keep the garment spaced from the wearer's body and also from any outer garment that may be worn over it.

CLOTH-HOLDER FOR BROOMS—The cloth shown attached to the broom in Fig 11 is held in place by means of a pair of U-shaped clamps designed for the purpose. They engage over opposite sides of the handle, pivots connecting the overlapping ends. The teeth on the upper sides of the clamps bend inward and secure the cloth against slipping.

PULSATING DEVICE FOR MILKING APPARATUS—Figure 12 shows a pulsating device that has been devised to give as perfect an imitation of the suckling operations of a calf as possible. The pulsator is connected between the service and pump pipes of the milking apparatus, and is provided with a valve subject to the drawing force or partial vacuum of the system. A controller, provided with connections for effecting the movement of this valve, cuts off and opens the air communication, thus providing pulsations.

DEVICE TO TEACH SWIMMING—A mechanical device for teaching persons to swim is illustrated in Fig. 13. It is a framework support provided with front and rear pulleys, elastic cables, and means for regulating the strokes of both arms and legs. The cable drawn out from the frame by the outward stroke of the left arm draws the right leg through the proper swimming movement, and the movement of the right arm applies the same action to the left leg. The elastic cable underneath the frame restores the limbs of the pupil to their initial position after each movement. Means are provided to prevent a downward stroke of the arms and to limit the downward stroke of the legs.

COMBINED KNIFE AND BOTTLE-OPENER—A more practical combination of a knife with some other tool than the one here illustrated (Fig. 14) would be difficult to devise. Such liquid refreshments as pop, ginger ale, grape juice, and like beverages, as well as nearly all aperient waters, are now corked with the metal bottle closer.

IMPROVED CAN-OPENING DEVICE—The can-opening machine shown by Fig. 15 is designed for rapid work. The can is first gripped solidly in the framework of the device, then the handle is pushed down, forcing the blades of the cutter through its top near the edge. A turn of the handle above the frame causes the cutter to make a complete circle.

METHOD OF COMPRESSING AIR BY MOVING WATER—A method of compressing air through the action of the waves is illustrated by Fig. 16. The compressor consists of a series of cells, each cell having an open end directly facing the body of water. The inward rush of the waves drives air into the cells, and this air is carried by pipes into a tank. Valves are provided in the pipes to allow the air to enter the tank when driven by sufficient force, but do not allow air to escape.

MEAT AND FRUIT PRESS—Figure 17 illustrates a press designed for the extraction of the juices of meat or fruit. The substance to be pressed is placed in the body of the machine, which is shaped very much like a flat-iron, and the turning of the press forces the juice out at the pointed end, where it falls into a cup or other receptacle.

INFANT'S BATHTUB—The portable bathtub shown in Fig. 18 has one exceptionally slanting end, provided with a base extension to give it solid support. A rubber seat and head-rest are provided on the slanting portion so that the infant can be laid down during the bathing operation instead of having to be held.

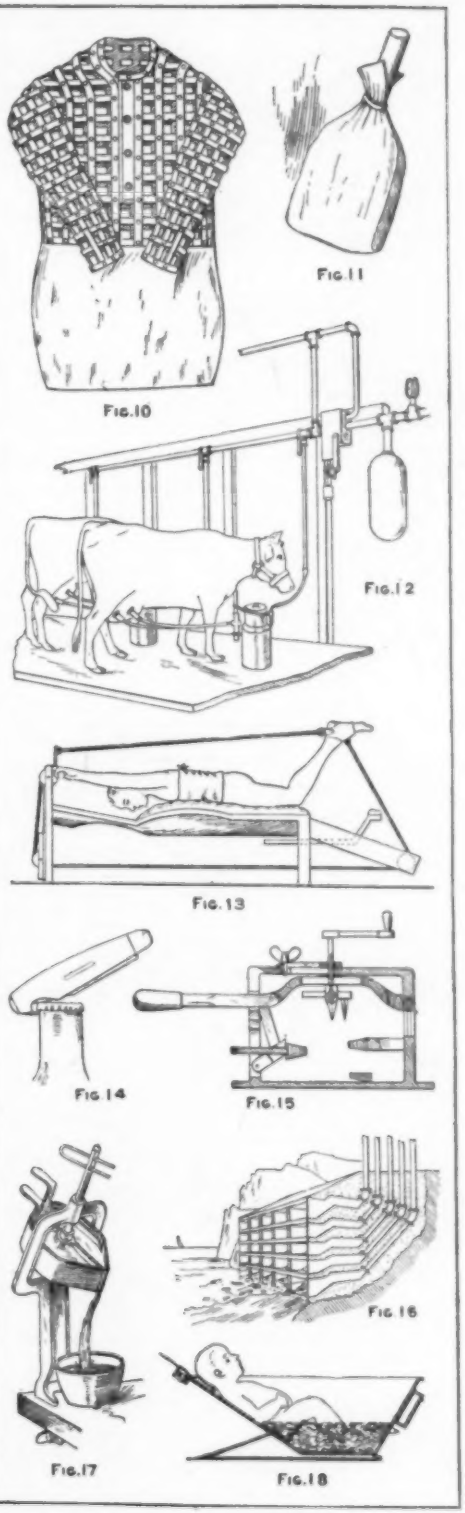


FIG. 10

FIG. 11

FIG. 12

FIG. 13

FIG. 14

FIG. 15

FIG. 16

FIG. 17

FIG. 18

THE navigating officer: "Admiral, the enemy's fighting airship has been sighted above the western horizon."

The admiral: "Call all hands to quarters. Hoist the grenade proof netting over the quarter deck. Raise the steel roof screens above the magazines. Spread the rubber sheathing aft. Get out the aeroplane destroyers. Fill the tubes with slugs and nails. Couple on the fire hose. He may drop nitroglycerin. Don't forget to have a crew of trusty men to work the shifting caps over the mouths of the smokestacks. And, Billinger——"

"Aye, aye, sir."

"Order up my triple steel helmet and upholstered shoulder pads. That fellow may drop oranges."

"Aye, aye, sir."—Cleveland Plain Dealer.

◆ ◆ ◆

"Now, in order to subtract," the teacher explained, "things have always to be of the same denomination. For instance, we couldn't take 3 apples from 4 pears, nor 6 horses from 9 dogs."

"Teacher," shouted a small boy, "can't you take 4 quarts of milk from 3 cows?"

◆ ◆ ◆

A very dirty boy attended a certain school. One day the teacher sent the boy's mother a note saying that he was not clean and that she ought to bathe him oftener.

The mother sent the teacher a note in reply, in which she said:

"My boy Bill ain't no rose. Don't smell him; learn him."

◆ ◆ ◆

Merton—"I'm going in for athletics now."

Burton—"Yes?"

Merton—"I roll all of my cigarettes myself now."

◆ ◆ ◆

"Yes," said the man in the mackintosh, "I once paid to see a professional rainmaker perform."

"Where?" queried the man who had his feet on the table.

"Out in Arizona. It took place in a baseball park, and the admission was 25 cents. There was a big crowd, too."

"Did he make it rain?" asked the man with the green goggles.

"He did not."

"Did you get your money back?"

"No; he gave us dry weather checks."

◆ ◆ ◆

Tall Man (at seashore)—He said anybody could manage a sailboat.

Thin Man—He did—what then?

Tall Man—His funeral is tomorrow.—Maine Journal.

◆ ◆ ◆

"Prisoner at the bar," said the portly, pompous and florid magistrate, "you are charged with stealing a pig—a very serious offense in this district. There has been a great deal of pig-stealing, and I shall make an example of you, or none of us will be safe."—London Daily News.

◆ ◆ ◆

"What's your order, sir?" asked the waiter.

"Bring me," said the wild-eyed customer, "some medium-boiled potatoes and some eggs with the jackets on."

"Sir?"

"I don't know whether I've got that right or not, waiter," said the wild-eyed man, "but do the best you can with it. A big red automobile had to jump out of my way about two minutes ago to keep me from running over it, and I'm a bit flustered."—Chicago Tribune.

◆ ◆ ◆

"How do you know when your husband forgets to mail the letters you give him?" "I always put a card addressed to myself among 'em. If I don't get it the next day, I know. And it only costs a cent."—Cleveland Leader.

Green Purchaser (in automobile warerooms)—My friend sent me here to get a rheumatic tire.

Clerk—Rheumatic? You mean pneumatic, don't you?

Green Purchaser—Perhaps it is pneumatic. I thought it was called rheumatic because it's swelled.

◆ ◆ ◆

"The automobile bids fair to change history, even natural history," said W. B. Rogers, the motoring expert, at a dinner in New York.

"A school teacher the other day was examining a class about Col. Roosevelt's African trip, especially about the specimens shot.

"Thinking of the rhinoceros, the teacher said to a dull, sleepy-looking boy:

"'George, what did they find in Africa that is very large, that is very dangerous to approach, and that has a horn?'

"'An automobile, Ma'am,' said George promptly."

◆ ◆ ◆

"Our fleet of torpedo destroyers seems to have stirred up our friend, the enemy," remarked the naval chief of one great power.

"Yes," replied his assistant, "it is said they will build a fleet of torpedo destroyer exterminators now."

"Let 'em; we'll build a fleet of torpedo destroyer exterminator annihilators."—The Fleet Review

◆ ◆ ◆

The following answers are taken from a number collected by a teacher in the Topeka schools:

"A blizzard is the inside of a hen."

"Oxygen is a thing that has eight sides."

"The cuckoo never lays its own eggs."—Indianapolis News.

◆ ◆ ◆

The crew of a way freight had discovered on the right of way a cow which they took to be dead, and the conductor had, by wire, so reported to the superintendent. The latter, anxious to get the facts of the case, immediately wired as follows to the section foreman on whose territory the animal was seen:

"Pat Ryan, foreman, Section 24.

"Wire complete report on cow killed on right of way near MP 45 Sec 24."

Pat got the wire all right and immediately started out to find the animal and investigate. He found her, and, after carefully viewing the "remains," sent one of his men back to the telegraph office with his answer to the "super." The answer read:

"Mr. Blank, superintendent.

"Cow killed by train wasn't killed by train. She died of eating raw buckwheat, but she ain't dead yet. If she dies before morning I'll bury her tonight. She was a good looking cow, too.

Ryan, Foreman Sec 24."

◆ ◆ ◆

Edna, who had been taught to report her misdeeds promptly, came to her mother sobbing penitently.

"Mother, I broke a brick in the fire-place."

"Well, that is not very hard to remedy. But how on earth did you do it, child?"

"I pounded it with father's watch."

◆ ◆ ◆

"Now, guard," said an eminent novelist, "remember if I have this compartment all to myself for the entire journey you will receive half-a-crown from me." "Very good, sir!" replied the guard, and he locked the door. All went well till they got to a certain station where an irascible gentleman pulled at the door of a locked compartment. "Guard! Guard!" he called. "Open this door! I've got the same right to travel in this carriage as anybody else, and I mean to do it!" The guard hurried up, whispered a few words to the irascible gentleman, who went quietly away to seek room elsewhere. "How did you manage it?" asked the author at the end of the journey, as he pressed the promised half-crown into the guard's hand. "How did you manage to get that bad-tempered old chap to go away so quietly?" "Oh, that was easy, sir!" replied the guard. "I told 'm you were a bit wrong in the 'ead!"